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The Farmer's Digest

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The Farmer's Digest

Volume 7 December, 1943 Number 7

Soil and Milk

Condensed from The Land

Professor Oscar Erf
Ohio State University

ONE of the first jobs my father gave me was to feed a group of calves. They had what veterinarians at the time called a "withering disease." That was sixty years ago. My father told me to feed these calves milk from cows which were fed first blades of grass and buds in early spring. It cured the trouble quickly. In those days people had heard nothing of vitamins or the effect of minerals in developing vitamins, hormones, or estrogenic substances. There were no such words in the language then, but good farmers often learn things before science finds words for them.

Traveling through Normandy several years ago I heard an old gentleman tell his son to feed some cattle seaweed. The cattle had begun to develop big necks and were becoming somewhat nervous and excitable. I sensed his basic thought—that the cattle were not getting enough iodine. When I asked what made him think that seaweed would help his cattle, he told me that his grandfather had told him this was a good practice; that there was something in seaweed that was good for the cattle which they were not getting from the feeds grown on their soil.

The protection of civilization depends fundamentally on the protection of soil fertility. It was Dr. Von Leibig who, in 1849, discovered mineral fertilization. Koch discovered the tubercular bacillus somewhat later and his assistant, Von Boehring, discovered that calcium of the cell tissue resisted the infection of the tubercular bacillus. Dr. H. H. Weber who was a chemist at the Ohio State University in 1896, began to think that the mineral of the food had much to do with the health of the animal and of man. He was my professor and tutor. He assigned me the problem of working out the chemistry of the composition of feed that developed various effects in the same strain of animals, also the chemistry of feeds that were grown

on soils of different fertility. The chemical procedure of analyzing these foods was well established to evaluate the proteins, carbohydrates and fats, but not the ash and mineral constituents. As we went into that, we began to see that the mineral content of a given foodstuff could vary according to the type of soil on which it was grown. We also began to get the impression that availability of minerals to plant life was essential and accounted for the factors of growth, maturing and quality of that plant.

Dr. Weber advised me to attend a series of classes given by Dr. Von Boehring at the University of Bonn. Von Boehring put me to work in his laboratories. We fed a cow, analyzing the feeds, and testing the milk and by-products. In the course of time it became necessary to dissect the cow, to cut the sixty feet of her intestines into twelve-inch segments, and to determine chemical changes in each segment as the food passed through in the process of digestion. It was tedious, but I later found the significance of the work that I had to do. Vitamins in 1900 were not considered important. But years of patient research gave support to Dr. Weber's contention that plant foods are not of simple structure. They exist as many complicated chemical organizations and today we recognize some of these as plant vitamins, hormones and enzymes. While vitamins were not even named at that time we began to realize that there were catalytic factors essential for metabolization of mineral constituents of the plant to be utilized as nutriment.

I returned to my home country enthused at the importance of the mineral problem. Further research led me to know that minerals combined in the cell of a plant are more effective in nourishing an animal than the pure minerals fed raw. But it was hard to get people, even scientists, excited or even interested. The idea of feeding a fertilizer like calcium to a plant was accepted by only a few pioneers in the field of nutrition at that time.

In 1912 a herd of Holstein Friesian cattle, owned by Maple Crest Farm, East Claredon, Ohio, was fed very carefully and made to produce large quantities of milk and butterfat. In fact, three-fourths of the world's record cows were in this herd of Holstein Friesians. A meeting of the Holstein Friesian Club at this place attracted more than four thousand breeders from all over the United States and Canada. Twenty-two calves were sold at an average price above $1,000 apiece. The buyers were attracted by the records produced. A number of calves not yet born were sold at the same rate, if they proved

to be female, and bull calves were sold at an average above $2,000, in fact one sold for $7,000.

Naturally, it became important that these calves be carefully raised. In the beginning, they were put in an ordinary calf barn and a number of them died. We were told by the local veterinarians that a new and more sanitary barn was needed. This was immediately built with a stable concrete floor and with the sides lined with hard maple wood. The stalls were also made of wood and the bottom was concrete insulated. It was nicely finished with oil, shellac and varnish.

Of course only those calves from the very important cows were kept in this barn in the beginning. In a few weeks these calves began to die as they had in the old barn. We brought in the best veterinarian from a New York university. He told us that the calves had an infection and that the stable must be disinfected with hot lye. This was done, with no perceptible change. We then secured the services of one of the best veterinarians from the State of Pennsylvania, who recommended the spraying of formaldehyde in all the crevices and corners of the barn. Since the calves were withering away like flies in the fall and exhibiting an intestinal infection, this seemed to be a sound procedure. But the calves kept dying.

Dr. Bousky from Denmark, one of the most outstanding cattle veterinarians of that time, was our next consulting physician. He recommended that the stable should be disinfected with potassium cyanide. This made it necessary to remove the calves for several months to some other place.

We had no place to put them save in an old log barn, about a mile away from the main plant. A few old cows were kept or hidden there as not of creditable appearance to be in the main herd. These cows got their feed by browsing around in the maple grove and from dry hays fed to them once a day. The milk from these cows that browsed around and lived on the wild grasses of the forest produced a milk that when fed to the calves immediately revived them. They got better. Not a single calf developed scours after this milk was fed for a period of ten days.

It was all vague and rather mysterious. What could bring about such a change? Many of the men workers in the dairy contended that it was a stable condition; in other words, according to their ideas, calves were not supposed to live under the extreme sanitary conditions that we had instituted. Calves, they maintained, lived much better and thrived better in an old log stable, even though the temperature va-

ried more than in the new stable which was heated during the coldest weather.

My immature thoughts went back to the days when I fed experimental cattle while working in the research station at Bonn University. It seemed to us after proper consideration that it must be a feed problem. So, after keeping the calves in the old barn for two months, a number of calves that had thrived were taken back to the new barn and half of them fed milk from the high-producing cows, and half were fed milk from the cows that were browsing in maple groves.

The test cows, naturally, were kept all the year around in a very comfortable stable and were fed only the rations that we had provided for them. In the course of three weeks, it was perfectly evident that the calves that were getting the milk from the high-producing cows gradually began to wither and began to develop diseases, particularly intestinal diseases. The younger calves, of course, developed into those conditions more quickly than the more matured calves, because the mature calves were not getting their sole nutrition from milk. In the course of six weeks, it became perfectly evident that these calves died from malnutrition because the milk from the cows that gave from 24,000 to 36,000 pounds per year, and made over 1,000 pounds of butterfat a year, was not normal milk.

In other words, the digestion in the cows developed short cuts. Since they were fed and milked four times a day it was evident that the paunch, which has as one of its functions to act as an incubator for digestive bacteria and which acts as a vitamin producer later on, is one of the factors from which the cow derives its cystine for the milk. This is because there is none of these vitamins in the feed that the cow consumes and as a result not sufficient time was given to properly disintegrate or for chewing the feed and the development of bacteria, nor was there time allotted for the endocrines to send out their hormones which would perfectly metabolize the grain and the feed that the cows were given every six hours during the day.

Incidentally, this milk also was shipped to a city and an important pediatrician used it as a food for infants. There was not as high a mortality among the children but sufficiently so that the cows' milk aroused some suspicion in the minds of some of the doctors as to whether cows' milk was the right food for small babies. One of the doctors proceeded to manufacture a baby food which is now used extensively through the United States as well as in other countries. Of course, in the beginning the mortality was high even

from this baby food, but fortunately, as science developed the essential factors, the food was improved and is today a much more complete food than some of the poor milks. However, there is still a question in the minds of many well-read, experienced pediatricians whether man can compound food that is so complete as milk of the average well-taken-care-of mother or a well-fed dam of bovine type of animal.

This experience covered a considerable number of years. By this time I was a thorough convert to the necessity of having sufficient minerals and sufficient vitamins and prohormones in a feed ration to make good milk and good meat and to develop good eggs. We knew now that we could probably improve the milk by feeding the cow better feed, more digestible, easier to metabolize. We found that feeding fresh ground corn, instead of old ground corn, decidedly improved the animal and also that grinding the oats fresh just before feeding was important. Wet feeding and soaking feed in slightly hot water was also important. We began to sprout the oats and found this improved the estrogenic physiology of the cows. They bred better and matured better calves, since calves from these high-producing cows were invariably deficient in the first generation after the high-producing period of lactation, especially if not fed on good feeds. In other words, there was something taken out of the system of the cow which was necessary to completely develop the calf.

From that time on, we began to find also that it was quite desirable to sprout the corn and give these animals green feed although we discovered that this had to be limited because of the laxative effect of the green material. However, there were enough vitamins and minerals liberated and easily digestible nutrients, plus the prohormones, to help digest the other feed. The calves on milk (which we tested at the same time on rats) grew and developed better, although at no time have we found that the high-producing cows, even with the best of feed (which, of course, is good nutritious grass in the spring) gave birth to calves as completely and as thoroughly developed as those of the lower-producing cows. In fact, the cow that gives 600 pounds of butterfat, or gives from 12,000 to 13,000 pounds of milk a year, including the dry period, can produce a more normal calf and better milk.

Years of research and experience show me, beyond doubt, that early grass gave us the most complete nutrition, especially if some of the grasses were leguminous, fed along with timothy and blue grass, plus the little white

clover and some of the acid grasses. This develops animals perfectly. From the earliest days, I can remember reading that green grass milk was considered the ideal milk. It is only due to the perverted taste of recent years that grass milk is not so acceptable. Every conceivable vitamin, prohormone and desirable nutritional chemical that the chemist has been able to test, has been found in green grass. Owing to the cutting, curing and storing processes the grass is deteriorated until very few vitamins and prohormones are left. Hay that has been rained on and been allowed to go through a heavy fermentation in the storage room usually is devoid of nearly all the important vitamins and prohormones which promote the growth and the complete nutrition of the animal—including especially the human animal.

Thinking along these lines, I first developed in 1917 a machine to dry the hay and preserve the vitamins. In the course of a great many exigencies, seeking to perfect this process, we found that methods which dry the grass in the presence of CO_2 gases, retain many of the desirable constituents for nutrition.

I believe that in the future, with some care, we can produce a food from green grass that will completely supersede our modern rations made out of grain.

To make good grass requires two very important things; first, the balancing fertility of the soil and, again, the regulation of the moisture problem. Grass grown a day or so after a warm rain is much richer in vitamins and nourishes far better than grass taken from a field which has had little rain for some time.

The regulation between water, sunlight, air and fertility, plus good land, determines the nutritive value of the food produced, and the health and productivity of man and his subject animals. The minerals such as calcium phosphorous, magnesium, iodine, iron, copper zinc, stannum, strontium, vanadium, tin, cobalt, and a host of trace elements about which we remain totally ignorant, and manganese, which is found to be a factor of reproduction, are all important factors in soil fertility and necessary in animal nutrition. The lack of these produces deficiency diseases or there may be an excess in the particular constituent that may produce poison in the animal and likewise in man.

For nearly three centuries we have been robbing the soil of fertility in the eastern states and for over a hundred years in the western and west central states, with only a slight application of fertilizer in recent years. This topsoil mining operation is still going on without any thought of replac-

ing these valuable life-giving constituents, or preventing the constituents from being carried away through soil erosion. Science promises to those, who will take advantage of the present knowledge of nutrition, increased resistance to infection, better physique, stronger, bigger stature, better health and additional years of life. Really good food can limit the mortality of tuberculosis, anemia, cancer, tooth decay, night blindness, nervous conditions and insanity. Really nutritious food will improve the morale of the people and develop a happier disposition in man.

Correct Milking Pays

Condensed from New Jersey Farm and Garden

The following milking rules and management practices will put more milk in the pail:

1. Handle cows in a quiet, gentle manner at all times, and especially at time of milking.

2. Keep strangers and dogs out of barn and avoid anything unusual that may cause excitement during milking time.

3. Exercise special care in handling first calf heifers until they become accustomed to the milking routine.

4. Avoid stimulating cows to let down their milk several minutes prior to milking; such as washing udders or using a strip cup. Such practices should be completed immediately before milking.

5. All cows that are stimulated to let down their milk and start leaking when they hear the rattle of pails or the milking machine pump should be milked first.

6. Fast milking—approximately seven minutes per cow—results in more complete removal of milk from the udder; because of hormone stimulus that gradually declines over a longer period.

7. Cows should be milked dry at every milking. Any milk left in the udder tends to aggravate or promote udder infections. Prolonged stripping, however, is undesirable.

8. When milking machines are used they should be properly adjusted and operated. Remove the machine when milking is complete to avoid injury to teat canal.

9. Rigid barn sanitation is most important. Segregate cows with infected udders and use disinfectants on milker's hands and milking machine teat cups to control spread of udder infections at time of milking.

10. Avoid udder injuries resulting from poorly constructed stalls or lack of sufficient bedding. Always check the development of sucking habit in growing heifers because of the danger of infection gaining entrance to the heifer udder. (From "Cowtesting Studies," No. 188.)

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Good Feeding Suggestions

Condensed from American Hampshire Herdsman

HOW American farmers can produce more pork to help feed a meat-rationed world and do it fast, at low cost, using the least scarce feed, with a minimum of labor—appears from feeding trials conducted by Gus Bohstedt, Robert Grummer and Burr Ross of the University of Wisconsin.

Pigs will have to put up with a form of "meat rationing," since tankage is scarce and expensive. The "meat" can be entirely omitted from carefully-planned swine rations, but a small amount of tankage generally gives somewhat better results, particularly for young pigs and breeding stock.

One of the most practical programs this Station has tested is a two-hopper plan calling for corn in one self-feeder compartment, and in another hopper a supplement made up as follows: soybean oilmeal or mixed soybean oilmeal and linseed meal, 49 lbs.; tankage, 20 lbs.; ground alfalfa hay, 25 lbs.; ground limestone, 4 lbs.; and iodized salt, 2 lbs.

Trials show that pigs are feed-wise enough to balance their rations remarkably well under this program. Young pigs eat about 1 lb. of supplement to 4 lbs. of corn, but as they grow older they consume a higher proportion of corn until the ratio is about 1 to 8 when they approach market weight.

It is not necessary to use bonemeal in a supplement containing 20% phosphorus-rich tankage. If the tankage is replaced by more soybean oilmeal, then results are slightly better if the ration contains some bonemeal along with a reduced amount of limestone, although limestone alone does well enough in a high-alfalfa ration.

A second type of feeding program, also highly efficient and labor-saving, trusts the pigs to make up their own rations from three self-feeders or feeder compartments.

As tested recently at this Station, the three-hopper plan calls for no tankage at all, but only soybean oilmeal and ground alfalfa as the protein and vitamin supplements. This sort of ration often is more economical than any for market pigs that are well past the weaning stage.

This is the arrangement of the three-hopper "cafeteria counter."

1. In one hopper place corn or mixed ground corn and other farm grains.

Reprinted by permission from the American Hampshire Herdsman, Sept., 1943

2. Use a mixture of three parts soybean oilmeal and one part ground alfalfa hay in a second hopper.

3. In a third hopper place a mineral mixture made up of four parts ground limestone, three parts steamed bonemeal, and two parts iodized salt.

A third plan that has given excellent results, though at the cost of more feed-mixing, is to place all the ingredients of the ration in one hopper. For greatest economy the formula needs to be changed when the pigs reach an average of 100 lbs. apiece, because from then on they need a smaller proportion of protein feed.

Here are formulas that have produced very economical gains in recent trials with the single-hopper system. From weaning time until the pigs weigh 100 lbs., use 61.5 lbs. ground yellow corn, 22 of soybean oilmeal, 15 of ground alfalfa hay, 1 of ground limestone and ½ lb. of salt. For older pigs, 73.5 lbs. corn, 10 of soybean oilmeal, 15 of alfalfa, 1 of limestone and ½ lb. of salt.

A farmer who is short on corn but has plenty of small grain will find it practical to use barley or oats to replace part of the corn in a swine ration.

Is there any danger that a ration will be too high in fiber for swine if it contains some oats in addition to 15% alfalfa? Apparently not. In recent trials at the Wisconsin Station, pigs made good gains on rations containing as much as 30% ground oats and 15% alfalfa.

Whether there is actually any advantage in using oats for swine, aside from making good use of home-grown feed, is not certain; but, it seems probable that a fair amount of oats may be beneficial for brood sows.

If pigs run on good pasture, there is no need to use ground alfalfa hay in the ration. But if the pigs are in dry lot, or if the pasture is poor, then plenty of good leafy alfalfa often makes all the difference between failure and success in producing pork without war-scarce milk and tankage.

Since corn will be fed in self-feeders, it should either be shelled or both shelled and ground. Trials at this Station some years ago showed it does not pay to grind new-crop shelled corn for pigs in winter; but in summer, when the corn is very hard and dry grinding usually pays.

Is the Bull One-half the Herd?

Condensed from The Ayrshire Digest

V. A. Rice

Massachusetts State College

THE history of civilization resounds with the explosions of old fallacies. Because Columbus doubted that the earth was flat, we now have America. Because Pasteur and Lister doubted spontaneous generation, we now have a host of useful chemical and bacteriological processes and aseptic surgery.

We progress then only by finding more true answers to life's problems than our forebears were able to. We have cited some general cases from men's long history. Our own specialty, animal management and improvement, is rife with interesting examples also. It was not so long ago that we dared not dry off a cow by simply stopping milking her, and dared not to milk a heifer or cow previous to calving. Until fairly recent times too, we knew that the record of a cow was a good indication of the production of her son's daughters, but sad experience has taught us otherwise. We used to think that an animal's appearance was a pretty good indication of its transmitting ability, but we burned our fingers on that one too. And so far as inbreeding was concerned, we knew that harm was its only possible contribution. But, fortunately for most of us, a Doubting Thomas is occasionally born. He doubts the old order; he has the courage to try something new and so mankind is enabled to climb a little higher. Scientists are nothing so much as Doubting Thomases. They mull over a problem, give their imaginations full rein, do a bit or a lot of experimenting and we have radios, airplanes, electric lights, and countless other gadgets and conveniences. Some of these Doubting Thomases work in the biological field and we have vaccines, immunizing serums, hybrid corn, white blackberries, and so on.

So too in the field of animal breeding have we had experimenters, all wittingly or not building on the solid foundation laid by an obscure monk in an Austrian monastery. We now know the general pattern of hereditary transmission and we are beginning to put it to work to produce more efficient and profit-

Reprinted by permission from The Ayrshire Digest, Brandon, Vt., Oct. 15, 1948

able livestock. In the process again many old ideas have been debunked.

So long ago that probably all chance of tracing it to its source has been lost, some sage laid down one of the most famous of Animal Breeding's maxims, "The Sire is Half the Herd." This has been pretty generally accepted. Now it in turn must suffer its debunking.

However, the process of debunking this time-worn maxim will not follow the usual pattern. Debunking generally means tearing down, showing that the old belief was harmfully untrue in going too far in the wrong direction. In this case, however, our task will be to show that while a step in the right direction, the maxim did not go far enough. The saying arose from the readily observable fact that in a herd of 20 cows the ten heifer calves born in any given year were likely all to be by the same sire—each separate cow contributing one-half the inheritance to her own calf, while the bull contributed one-half the inheritance to all ten of the calves. The ten cows might very well have been the daughters of another sire so this sire is one-half the present herd—the sire of the calves in turn would be one-half of the future herd. So in general, a bull is one-half the herd. This is fine as far as it goes and the increased scrutiny levelled at bulls in recent times is part of its harvest of good.

If the present sire is one-half the herd, however, we are naturally led to the question—what is the other half? The obvious answer would, of course, be the cows are the other half. While in a sense this is true, in a larger sense this is another fallacy.

Perhaps we can make it a little clearer by means of the diagram shown as Figure 1.

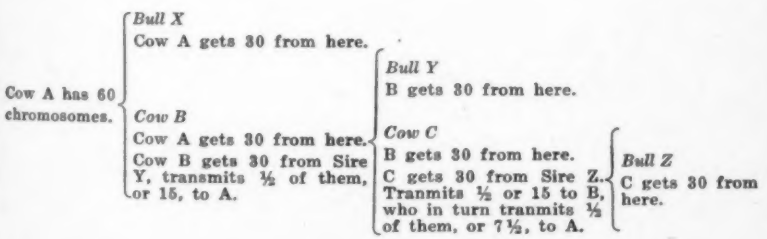
Cow A has 60 chromosomes.
Bull X
Cow A gets 30 from here.
Cow B
Cow A gets 30 from here.
Cow B gets 30 from Sire Y, transmits ½ of them, or 15, to A.
Bull Y
B gets 30 from here.
Cow C
B gets 30 from here.
C gets 30 from Sire Z. Tranmits ½ or 15 to B, who in turn tranmits ½ of them, or 7½, to A.
Bull Z
C gets 30 from here.

Figure 1. Showing the Sources of Any Cow's Inheritance

60 Chromosomes = One Cow

Science has clearly demonstrated that the hereditary material which determines qualities exists in 30 pairs (chromosomes) in cattle. (The number in the human is 24 pairs, corn 10 pairs, all the members of each species of plant and animal have a characteristic number.) Inheritance has also been demonstrated to be a halving and sampling process. All that this means is that every animal gets one or the other member of each pair of chromosomes which its two parents had. As an analogy we might let coins represent chromosomes and think of a bull having two quarters, two dimes, two nickels, etc., for 30 different pairs of coins. This bull got one quarter, one dime, one nickel, etc., from his sire by way of a sperm, and one quarter, one dime, one nickel, etc., from his dam by way of an egg. Each sperm which this bull secretes will contain one quarter (either one), one dime (either one), one nickel (either one), etc. In other words, each animal transmits a random sample half of his or her total inheritance to each of its offspring.

In Figure 1, therefore, Cow A has 60 chromosomes, 30 of which have come from her sire X and 30 from her dam B. This is the basis for the old maxim that the bull is half the herd. But let's carry our reasoning back a little further. We just said that Cow B transmits a sample half of her inheritance to her daughter A. Now Cow B (like all members of the cattle family) has 60 chromosomes. Of these, 30 came from her sire, Bull Y. She gets 30 from Bull Y and, on the average, transmits one-half of these among the 30 which she transmits to her daughter A. In other words, A gets 30 chromosomes from her Sire X and 15 from her material grandsire Bull Y. Let's go back one more step. Cow C gets 30 chromosomes from her sire Bull Z; she transmits one-half of these or 15 (on the average) to her daughter B; and B in turn transmits one-half of these 15, or seven or eight to her daughter A. So at this point we see that Cow A has 60 chromosomes and we may be surprised to learn that while one-half of these, or 30, came from X; another one-quarter or 15 have really come from her maternal grandsire Y, and one-eighth or seven or eight have come from her maternal great grandsire Z. So, while one-half the inheritance of Cow A comes from her dam B, we have seen that the greater part of this can rightfully be traced to B's sire and maternal grandsire. (If you care to say that Cow A gets 50 percent of her "blood" from X, 25 percent from Y and 12.5 percent from Z, you are saying the same thing that we

have said in terms in the actual hereditary determines, the chromosomes.)

In summary, therefore, we have:

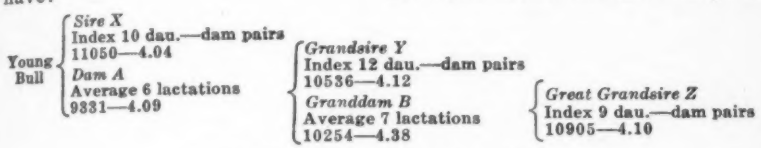

Figure 2. Pedigree of Possible Herd Sire

Now what part of 60 is 52.5 chromosomes? If we divide 52.5 by 60 and multiply by 100, we have the figure 87.5. In other words, 87.5 percent of Cow A's inheritance ("blood") has come from the last three sires which this dairy breeder has used.

So, is the bull (immediate sire) 50% of the Herd?—Yes. And what is more important, the last two bulls used in the herd are 75% of the herd and still more important, the last three bulls used in the herd are 87.5% of the herd. Likewise the last four bulls used account for 93.75% of the hereditary qualities of the present herd, etc.

It is seen, therefore, that in debunking the old maxim "the bull is 50% of the herd," we have made bulls assume a more rather than a less important role in our thinking and breeding.

We know that a given series of three or four bulls really make or break a herd and its owner. Surely there is no more important problem which the dairy breeder has to face than the one of getting a series of good sires.

If the individual breeder had to work alone in this field, his task would be a very difficult one. The fact is, of course, that up to the very recent past, he has had to work alone and the results of these individualized and scattered endeavors have not been very heartening. Dairy cattle breeders have had to work alone, had to try to build on such flimsy foundations as the individual record of the dam of their herd sire, on the records of a carefully selected group of daughters of a bull (the bad ones being left out of the averages), on distant relationship to supposedly meritorious animals, and at the same time they have had to withstand gales of high-powered ballyhoo, salesmanship and advertising. That the structure they have reared has been able to stand up at all merits our wonder and amazement.

But times are changing—Breed Associations are waking up, aroused by the alarm clock of science in the barn-yard. Let's not be too hard in our judgment

of breed associations. Until the present, or very recent past, they could do no better—because the scientific basis for something better was not known. In the Ayrshire Breed Association bulls are being approved if their first ten unselected daughters meet certain stiff requirements. Bulls are being proved (tentative) on the performance of their first five unselected daughters. And bulls are being appraised (more tentatively) as soon as the first five of their unselected daughters have been milking for a few months. If Ayrshire breeders play the game as they should, they will know the prospects of their bulls long before they are five years old. They can then slip them into heavy service while there is yet time to cash in on their worth, or they can slip a knife into their throats before they completely wreck the herd.

As we have said, this all important job of getting the low-down on the bulls of any breed cannot be done by individual breeders. They haven't the basic foundation of scientific principles involved in inheritance and they are too busy with the everyday jobs of milking, feeding, caring for sick animals, making hay, etc., etc. This is rightfully the job of the Breed Association.

Now this is not to say that the breeder cannot do anything to help himself in this regard. First and foremost he has got by some hook or crook to keep on getting records on all the animals in his herd year after year, come War or high-water. The writer once heard a breed secretary say, "You can't breed good cattle with a pencil." We replied "You can't breed good cattle without a pencil." What the Secretary meant was that armchair geneticists were of no value to the practical breeder. What we meant, of course, was that if a breeder did not get records of production year after year, and records on all offspring, rather than a selected few, he would simply stumble around in the dark and get nowhere.

Records are the one indispensable requirement for improving any class of livestock and breeders know and appreciate the fact that they must get records on all the daughters of their bulls, not on a selected few. The value of the records of course is the simple fact that they give us the only information it is possible to get on the genetic or breeding ability of our animals. It is true, of course, that the record of a cow is not a complete picture of her breeding worth or of her genetic make-up, because how much milk a cow actually gives depends a lot on her environment, how she was grown, her condition at calving, the feed and care she gets while milking, etc. And likewise, the average production of a group

of daughters of a given bull does not give a complete picture of the genetic or breeding worth of that bull and for the same reasons. However, we can measure the breeding worth of a bull accurately enough for all practical purposes by comparing the type and production of a group of his daughters with the type and production of the dams of these daughters. This is generally true because the daughters of a bull are generally milked and handled in the same barn and under the same general conditions as were their dams.

We can put more faith in the index of a bull as measuring his genetic make-up than we can in the record of any given cow as measuring her genetic make-up. The reason for this is the fact that the cow is the result genetically of only one sample half of the inheritance of her own sire and dam while the bull's genetic make-up is being appraised from several sample halves of his inheritance as expressed in the several daughter-dam comparisons which provide his index figure. Any one cow may get a better or worse than average sample half of her parents' total inheritance. Likewise a bull may transmit a particularly good or a particularly bad sample half of his inheritance to any one daughter, but if we get and test several of his daughters, these especially good and especially bad samples tend to cancel each other, thus giving us a more true average for the bull.

When indexes become available on most bulls of the breed, it should be possible to avoid many of the pitfalls of selection into which we have stumbled in the past. Some people tend to deride indexes because they say that most bulls are dead before you can get their indexes. This may be true and may continue to be true, but bull indexes are invaluable nevertheless because we can use them in pedigrees.

As an example, let us assume that you have a herd of cattle which average to produce 9550 lbs. of 4.0% milk per 305 days. You are considering a young bull whose pedigree is given in Fig. 2.

	Milk	Test	Take			
Sire X Index	11050	4.04	50%	=	5525	2.020
Dam A Record	9331	4.09	10%	=	933	.409
Grandsire Y Index	10536	4.12	25%	=	2634	1.030
Granddam B Record	10254	4.38	5%	=	513	.219
Great Grandsire Z Index	10905	4.10	10%	=	1090	.410
Total				=	10695	4.078

Should we buy this young bull to use in the above herd? Let's apply the formula suggested in Figure 1. That formula said to take 50% of the sire's index, 25% of the index of the sire of the dam and 12.5% of the index of the sire of the maternal granddam. This would leave 12.5% to be apportioned between the dam and the maternal granddam. In order to give us somewhat easier figures to work with, we will take 10% of the index of the sire of the maternal granddam and so have 15% to be apportioned between the dam and the maternal granddam. Of this, 15%, we will apportion 10% to the dam's record and 5% to the maternal granddam's record. So on the above basis we would have the following tabulation in order to secure this young bull's pedigree expectation in terms of amount of milk and fat percent.

COW A

In Chromosomes	In "Blood"
30 from X	50 % from X
15 from Y	25 % from Y
7.5 from Z	12.5% from Z
52.5 from these three bulls	87.5% from X, Y, and Z

This young bull's pedigree gives us an expectation that he has inherited the ability to transmit at the level of about 10,700 lbs. of milk testing about 4.08%. Since the cows in our assumed herd average 9550 lbs. of milk with a test of 4.0%, it would seem that this young bull should be able to increase production of his daughters from these cows.

The above figures for this young bull derived from the indexes and records in his pedigree are the general average expectancy. Whether this young bull got this average expectancy from the sample halves of inheritance which he got from his sire and dam time alone will reveal. He may have gotten better than average samples from his parents, he may have gotten worse—*there is absolutely no way to tell which he has gotten except by using him and testing his daughters.* He should be used as early as possible on 14 to 20 cows in order to get seven to ten daughters, and then retired from service, or better leased or loaned until we can see what his daughters are going to do. This may seem like a long slow process but to the writer's knowledge there are no short cuts. It hardly seems necessary to add that if this young bull had come out with a pedigree expectancy of 8350 lbs. of 3.8% milk, he should not be used in the herd under consideration.

Just a word more about the formula suggested in Figure 1. In the first place we have assigned 50% of the inheritance of any animal to the sire's side of

the pedigree and 50% to the dam's side, which experience, logic and genetics all indicate should be done. You may wonder why we did not go back any farther on the sire's side of the pedigree, but stopped with the immediate sire. The reason for this is the fact that we assume we have an index on this sire. In other words, we know by comparing his daughters and their dams what this bull is transmitting. If we know what he is actually transmitting, we are less interested in what may be behind him in his pedigree. Our gain in simplicity, by stopping with the sire, is more than offset by the possible loss incurred by not going back further in his pedigree. Of course, if this were a young bull which could not yet be indexed, we would simply appraise his pedigree with the formula suggested by Figures 1 and 2, and use this pedigree expectation until it could be supplanted with the bull's actual index.

You may also be disturbed by the fact that we have assigned only 10% value to the record of the dam. The reason for this is the fact, already referred to, that the actual record of a cow is generally a poor indication of her genetic make-up since her production is so greatly influenced by her feed and environment. And in addition, she is the result of but one sampling of the inheritance of her sire and dam, while a bull's index is the average result of several samplings of his inheritance.

Breeders can take a lot of the guess out of breeding if they will continue to get records on all the cows in their herds year after year so that bulls may be indexed in ever increasing numbers and then will use the records in an intelligent manner consistent with the known genetic facts regarding the transmission of hereditary qualities from ancestors to offspring. And, we repeat, indexes on bulls are invaluable even though bulls may be dead before we can index them because the indexes don't die with the bulls, but can be used in evaluating pedigrees of young animals even though most or all of the youngsters' ancestors may be dead.

The Family Farm Must Produce More

Condensed from Capper's Farmer

F. W. Duffee
University of Wisconsin

THE Family Farm must be mechanized. Its human muscles cannot compete in future production with the machines of bigger neighbors. It must be expanded to an acreage that will permit efficient employment of labor-saving equipment. It must offer security for its operators. It must be organized and equipped so income per man will be adequate and desirable. That means increased production per man—more output of milk, meat, eggs, fiber, more output of crops at less expense in human energy. The only way a farmer can multiply his muscular power is by use of machines.

Equipment and methods for mechanizing production and harvest of small grains and corn already have been developed. Altho they are not yet universally applied, they are fairly common and available to any farmer who will use them. We are in the process of mechanizing hay and forage harvest. Altho neither the equipment nor the methods are perfected, a practical, workable system is available, announced within the year from experiments at the University of Wisconsin. So it now is possible to mechanize the family farm completely. It cannot be done overnight. Too much reorganization is required.

Men rightfully seek relief from the human drudgery of farming. I believe Dick Hopkins, Columbia county, Wisconsin, expressed a common hope. After watching the corn-cutting attachment of the forage harvester in operation, he said: "Duffee, in a little while, when this equipment is fully developed, farming is going to be fun."

During 10 or 15 years, efforts of designers and manufacturers have been toward making machines that would fit the smaller farms. That is where the big saving in human labor needed to be done. Examples of this effort are the small combines, the 1-plow tractors, narrow-swath forage harvesters, single-row 1-man corn pickers. And that effort is continuing, for example, in the 1-man hay press.

Now, I think it is time to consider some adaptation of farms to the equipment available. Mechanization will be pointless unless

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it improves a man's income and his living standard. Because the dairy farm is the best example of the family production unit and because it has offered the greatest obstacles to full employment of power equipment, I want to discuss mechanization of that type of farm.

The day is past when a man can make a living and enjoy the conveniences of modern times by milking 10 or 12 cows. Yet there are thousands of men on so-called family farms who are trying to do just that. Let us consider some Wisconsin statistics. The U. S. Census of 1940 listed 186,735 farms in the state. Of these, 167,053 reported an average of 13.1 milk cows and heifers per farm. The same census lists 63,379 farms which kept less than 10 cows in 1939; and 114,598 with not more than 14. There were 31,246 farms which kept 15 to 19 cows.

In 1920, 171,348 farmers milked an average of 10.4 cows, or only 2.7 less than the average for 1940. Aside from some increase in production per cow between 1920 and 1940 (but it was lower in 1940 than in 1929) and disregarding price for the product, let us see what the dairy farmers were trying to make the extra 2.7 cows per farm do. That 20 years marked the development of many power machines, the advent of radio, the expansion of good roads and general use of automobiles, the extension of rural electricity, greatly expanded public services and taxation.

So the Wisconsin dairy farmer found his living costs and his obligations to state and national Government multiplied. His standard of living went up. He bought automobiles and new farm machinery, modernized his home. He wanted all the equipment that electricity made available—ranges, radios, refrigerators, sweepers, fans, toasters, food mixers, washing machines, running hot and cold water. He wanted a central heating plant, an air-conditioning system. Extension of distribution over good highways brought goods to his local merchant that never had been available outside metropolitan centers. He became a traveler —motored hither and yon across the country. His operating expenses went up. He had to pay off a mortgage debt contracted at inflated values with a deflated income. His children went to high school and college. He bought more life insurance, went to more picture shows, ball games. His young folks sought paid entertainment in town. All this he tried to do on the income from 2.7 cows.

It can't be done. The earning power must be increased to meet reasonable spending needs. To do that, I believe a man must be-

come a member of a crew on a fully mechanized farm, big enough to justify the equipment. A minimum of 2 or 3 men is necessary to do certain work efficiently.

How big a unit would be required? In the highly developed dairy regions of Wisconsin, I believe 300 to 350 acres of crop land would be required in addition to pasture, waste and woods. The herd should contain 50 to 60 cows. That would be a minimum of 100 or 125 acres of crop land and 16 to 20 cows a man. Elsewhere the units would vary with the type of production emphasized, with the section of the country and with other factors. For such a farm in Wisconsin there would be 100 to 125 acres of hay crop, half of which could be made into silage and half into dry roughage; 100 to 125 acres of small grain; 75 to 100 acres of corn or similar row crop.

The ideal setup sociologically would be some form of father and son arrangement. I look forward to the time when farmers will retire on their own land rather than to town, where they soon wither away and die from lack of interest in anything. The necessary minimum of man power for an efficient unit can be afforded by a father, son and hired man; by a father and 2 sons; by 3 brothers; or several in-laws.

The entire farm must be streamlined and organized — large, regular fields, proper location of lanes and fences, a definite rotation, conveniently arranged farmstead and buildings, efficient facilities for feed handling and storage, a well-equipped milkroom properly located, a labor-saving milking barn and young stock shelter.

Equipment required will include:

A—One full 3-plow tractor on rubber, about 35 horsepower. I prefer a standard type but some farmers may disagree. It will power: 1—A 3-bottom plow. 2—A 10-foot tandem disk with trailing 15-foot drag harrow; or a 21-foot single disk. 3—A forage-harvester, field hay-chopper with pickup for dry hay and straw, with a 1-row corn-cutting attachment. 4—Heavy, high speed hauling when the light tractor is not free.

B—A medium-sized 2-plow tractor, about 25 horsepower, of the general-purpose or tricycle type will be required for operating: 1—A 9-foot 4-inch or 9-foot 11-inch fertilizer drill. 2—A 10-foot corrugated roller with grass-seeding attachment. 3—A 2-row or 4-row highspeed corn planter with fertilizer attachment. 4—A 2-row or 4-row corn cultivator. 5—A 2-row rotary hoe. 6—A 5-foot or 6-foot combine with auxiliary engine developing at least 20 horsepower. 7—A 1-row trail-

er-type corn picker, or 2-row if custom work is done. 8—A 7-foot tractor mower. 9—A side-delivery rake.

C—Other crop and field equipment needed: 1—A blower for grass silage, chopped dry hay, straw and field cut row-crop silage, powered by the combine engine. 2—A large size, 2-wheel tractor-type manure spreader. 3—Three wagons with 8- by 14- or 16-foot racks suitable for hauling grass and corn silage, chopped dry hay and straw, ear corn and threshed grain.

Barn equipment will include everything to speed chores. A milking machine is necessary and a gutter conveyor highly desirable. A milkhouse as close to the barn as regulations will permit also will save time. It must be equipped with everything that will expedite handling and caring for milk. Barn arrangement and feed storage must be studied carefully. Barn procedure must be well organized.

Two of the men will carry on field work with the 2 power plants and the assignment of each must be as explicit as possible. The third man will have charge of the milking, assisted by one other man, barn cleaning, feeding livestock, repairing fence, pasturing cattle, hauling seed and fertilizer to the field. He'll meet the salesmen, the neighbor who has business at the place, make trips to town. Likewise he'll be afield during hay, grain, silage and corn harvest.

A system of milking a cow in 3 minutes is now being demonstrated in the University dairy barns. Two men with 3 units are milking 50 cows in 50 minutes, and they are carrying the milk 150 feet. It's a matter of well-organized procedure and of carefully studied personal efficiency by the milkers.

To apply this system on any other type of farm, where another livestock enterprise may be emphasized, requires only adjustment. The idea is not theoretical. I personally know of several cases where essentially the system I am suggesting has been established. And it was done before the forage harvesting equipment was perfected and before the faster milking procedure was established.

In some cases land belonging to 2 or more men has been pooled to make up a unit of necessary size. In others additional land has been purchased or leased. A near approach to the suggested mechanization could be effected by neighbors who would buy and operate the necessary extra equipment cooperatively. The crew-type jobs could be handled with custom equipment also. But in any case, remember that the object is increased output per man

beyond averages of the last 20 years.

When this mechanization of the family-type farm has been completed, it will have become *more* deeply entrenched than ever into the economics and social life of this nation.

Use Feed and Labor Efficiently

Condensed from Guernsey Breeders' Journal

G. E. Gordon

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WARTIME dairy conditions, with shortage of man-power and an increasing shortage of feed, emphasize the importance of using both of these critical factors as efficiently as possible. Cost studies carried on throughout California over a period of years indicate that feed and labor make up around 80 to 85 per cent of the total cost of producing milk and butter fat.

It is, of course, well-known that good cows make more efficient use of feed than do poor ones, because their maintenance requirements are relatively stationary and they are therefore able to use a higher percentage of the total food intake for production. It is also well-known that, while labor requirements per cow may be higher with high-producing cows, the labor requirements per lb. of fat or per 100 lbs. of milk are much lower with good cows than with poor ones. Therefore, where either feed or labor, or both, are limited, it is obvious that cow numbers should be adjusted to the available feed and labor supply by the elimination of the lower-producing cows.

One of the most valuable labor-saving devices available to dairymen is the use of pasture. Good pastures provide natural feed for dairy cows, and their use improves the quality of the ration while at the same time reducing the cost. Cost studies on California farms indicate that approximately one-third of the total cost of hay is in the harvesting. Properly handled pastures will usually produce as much or more feed per acre as the same land in hay. By allowing the cow to harvest the crop herself, the cost of the ration is reduced while at the same time labor requirements are lowered. Pastures are giving ex-

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cellent results in providing all or part of the roughage requirements. The use of pastures for dairy cows is desirable for as long a period during the year as it is possible to provide satisfactory pasture of either a permanent or temporary nature.

Concentrates for dairy cows have recently developed into one of the most acute problems in connection with the food production program. Supplies of concentrates are scarce and are high in price, with the high-protein concentrates quite limited. This situation requires dairymen to make many adjustments in their feeding program if they are to continue satisfactory production. The protein situation may be improved by the growing of as many legumes for pastures, hay, and silage as possible. The concentrate problem can be improved by the feeding of concentrates according to the individual needs of the cows as indicated by their production records.

Concentrates are wasted in the feeding of dairy cows in two ways: One is by feeding some cows more than they can make use of for milk production; and the other is by failing to feed good cows as much in the way of concentrates as they require to enable them to produce efficiently and according to their inherited ability.

Probably the greatest reason why more cows are not fed according to production is because of the feeling of dairymen that labor requirements are excessive under such a program. This point of view cannot be substantiated in view of many examples of dairymen who are feeding according to production with little or no additional labor requirements. Feeding according to the individual requirements of the cows in small dairies, where all labor is carried on by the owner, is not difficult. A card showing the names of the cows and the number of lbs. of concentrates to be fed at each milking, can be attached to the feed cart. In small herds it requires comparatively little additional time to weigh out the feed for each cow under such a program. A new card can be made each month, after the tester's visit, to indicate the amount of grain each cow should receive. In larger herds, and particularly those of 100 or 200 or several hundred cows, where all feeding is done by hired labor, the problem is not so simple. Satisfactory methods have been developed, however, that have been highly successful in feeding according to production, without increasing labor requirements. Some examples probably will best illustrate how this has been accomplished.

Let us take, as an example, one southern California dairy of almost 100 cows, with 72 in milk at

the time of the trial. The two brothers who operate the farm knew their cows quite well and were attempting to feed them according to their individual needs, although no specific chart of feed requirements was used. A feeding trial was developed to determine the value of feeding the cows individually according to their production records. The first month of the trial, the cows were fed as in the past, with complete records being kept of all hay, silage, and particularly of concentrates used.

At the beginning of the second month, following the cow tester's visit, the amount of hay and silage was maintained at previous levels, but concentrates were fed according to individual needs. It was not proposed that the concentrates be weighed for each cow, but a scoop was obtained which held approximately one lb. of the concentrate mixture. The barn was not large enough to accommodate all cows at one time; so it was filled twice at each milking. The cows were all trained to come into the same stanchions at each milking. On the stanchion in front of the cow was written, with chalk, the number of lbs. or scoops of grain she was to receive at each milking. Immediately below this number was placed a similar number indicating the number of scoops of grain the cow standing in that stanchion in the second string was to receive. The amount of grain to be fed was determined by dividing the total lbs. of fat produced monthly, by five, to indicate the number of lbs. of grain each cow was to receive daily.

The cows had formerly been fed rather liberally, receiving approximately 11 lbs. of grain per day on the average, in addition to their hay and silage. For the month starting the feeding trial, each cow was fed according to the above plan. The owners stated that it took no longer to feed them in this manner than had been the case previously, as they stated that it took no longer to give one cow five scoops and the next one three than to give each cow four scoops of grain. They also stated they dished out four or five of these small scoops as quickly as they could one of the larger scoops which they had formerly used. At the end of the second month it was interesting to note the results secured, as indicated in the table below.

This feeding trial showed a saving of approximately one-third of the concentrates used, with no loss in production,—the milk being slightly down and the fat production slightly up in the second month over the first. The results were so convincing that the method of feeding was, of course, continued.

It was interesting to note the total fat production for the year

as well as for the two months of the specific trial. These two months in the trial were in the middle of a testing year in which 77 cows produced an average of 10276 lbs. of milk and 388.6 lbs. of fat. In the testing year prior to the trial, there were 70 cows in the herd that produced an average of 8490 lbs. of milk and 350.8 lbs. of fat. In the testing year following the year in which the trial was conducted, 103 cows produced an average of 9002 lbs. of milk and 411.1 lbs. of fat. In other words, the feeding trial was in the middle of a three-year period during which the average production of all cows was definitely on the increase. The owners felt that feeding definitely contributed to this increase in average production, although they did not attempt to give feeding full credit for all of this increase. From the standpoint of feed cost alone, however, the feeding method was amply justified. With hay and silage being maintained at the same levels, the saving in concentrates amounted to $165.36 per month at $39 per ton (which was the cost of the ration at that time) and resulted in reducing the cost of production per lb. of fat by 9.2c per lb. The only additional labor required to achieve these results was in changing the numbers on the front of the stanchions of some of the cows once each month, which required only an hour or two with the help of the tester.

The job of feeding the cows according to their individual producing ability on large dairies where they do not come into the same stanchions, or in walk-through types of barns, presents other problems. A large dairy in northern California, milking around 300 cows, has solved the problem of individual feeding in a very satisfactory manner. On this dairy the cows are milked in a walk-through type of barn. They are brought into stanchions where they are fed and washed; they are then segregated into holding pens to await their turn to be milked, while another group of cows is brought in and fed and washed. Each cow in this herd has a chain around her neck, and at the bottom of the chain is a metal tag. These tags are of different shapes (some round, some square, some diamond-shaped, and some oblong) to make sure that cows are milked by the same

	No. of Cows	Total Milk	Total Fat	Total Concentrates Fed
First Month	72	55,943 lbs.	2,112.4 lbs.	25,360 lbs.
Second Month	72	53,566 lbs.	2,173.9 lbs.	16,880 lbs.
Concentrates Saved				8,480 lbs.

milker each time. In other words, all cows with round tags go into one holding pen and are milked by the same man each time. Under this system of handling, it appeared that the best method of indicating the amount of concentrates required would be by the use of the chains around the cows' necks. Obviously, the cows could not be fed their concentrates until they were brought into the barn, inasmuch as they did not come into the same stanchions each time. It further was not possible to feed the cows strictly in accordance with their production records because of the impracticability of attempting to mark each cow individually.

It therefore seemed wise to indicate their feeding requirements by groups. This was done by putting colored celluloid chicken-leg-bands in the links of the chains around the cows' necks. Cows that produce 60 lbs. of fat, or more per month, have rings of three colors (yellow, green and blue) and they are the top producers of the herd. These cows receive 16 lbs. of grain mixture per day. The grain mixture is not weighed for each cow, but is fed with a scoop that holds approximately two lbs. of grain mixture. When a cow drops to, say 54 lbs., the blue ring is removed, leaving the yellow and green rings, which indicate that the cow is in the 50-60 lb. class; she receives 12 lbs. of grain instead of 16. When the cow drops to the next lower group, another ring is removed, and she receives only eight lbs. of grain; and when no rings are left in the chain, it indicates that the cow is in the lowest group and receives the minimum amount of grain mixture.

The owner of this herd adjusts the rings personally, going through the herd immediately following the tester's visit each month, and removing the rings as indicated by the cow's production record. He also gives consideration to the physical condition of the cow, in order that a cow or young heifer that may be quite thin may remain in a higher group than her production indicates, in order that she may be brought into better physical condition for her next lactation. The time required is part of one afternoon, each month, as no additional time is required for the feeder.

The owner states that this method has reduced the amount of concentrates required by 15 per cent, while at the same time it has increased the average production of his cows by 40 lbs. of fat per cow per year. This is a dairy, supplying market milk for the Bay area, that has averaged more than 400 lbs. of fat per cow for the last several years,—having increased their production from 242 lbs. average in 1929.

An example of results that can be secured by a combination of feeding according to production, and culling of low producers, occurred in a large market milk dairy in southern California. When the herd was put on test, there were 230 cows in the herd, with 209 in milk, and they produced a total of 6002 lbs. of fat for the month. The lower-producing cows were culled and the others were fed according to their production records, so that within two-months' time the herd had been reduced by 10 per cent in number of cows, with total fat only dropping to 5907 lbs. produced for the month. One year later, there were 200 cows in the herd, with 181 milking, that produced 6829 lbs. of fat,—or an increase of 827 lbs. of fat with less cows; while at the end of 16 months, with 200 cows in the herd, the total fat production was 8278 lbs. for the month. This trial resulted in the dairy herd being reduced by one string—or about 12 per cent in cow numbers—and the resultant saving of the labor of one milker as well as the saving of the feed for one string. At the same time the total fat was increased from 6002 to 8278 lbs., or an increase of more than one-third. The slight increase in labor required for culling and feeding was more than offset by the saving of the feed and labor due to the reduction of the herd, as well as by the increase in total production.

The adjustment of cow numbers to available feed supplies, and the feeding of cows according to their individual needs as indicated by their production records, cannot be over-emphasized as a means of adjusting our dairy industry to the limited supplies of feed and labor that are now available.

	No. Cow	Ave. Prod.	Total Prod.
First Year	39	247	9633
Second Year	31	215	9765

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUG. 24, 1912, AND MARCH 3. 1933

of the Farmers Digest, published 11 issues a year at Ambler, Penna. for October 1, 1943

State of Pennsylvania
County of Montgomery } ss

Before me, a Notary Public in and for the State and County aforesaid, personally appeared A.E.Heick, who, having been duly sworn according to law, deposes and says that he is the busines manager of the Farmers Digest and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit: 1. That the names and addresses of the publisher, editor, managing editor and business manager are: Publisher, L. Bush-Brown, Ambler, Pa.; editor, L. Bush-Brown, Ambler, Pa.; assistant editor, C. Leavitt Dyer, Baltimore, Maryland; business manager, A. E. Heick, Ambler, Pa. 2. That the owners are: L. Bush-Brown, Ambler, Penna.; C. Leavitt Dyer, Baltimore, Md.; A. E. Heick, Ambler, Penna. 3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: none. Signed, A. E. Heick, Business Manager.

Sworn to and subscribed before me this 1st day of October, 1943 (Seal). Mary C. Cassidy, Notary Public. [My commission expires at the end of next Session of Senate.]

Vacations with Pay for Dairy Cows

Condensed from American Agriculturist

EVERY dairyman will agree that a cow needs a yearly vacation, but during that vacation when she is dry many a cow gets a maintenance allowance instead of full pay. When you consider that a cow is willing to do a good production job for her owner, just for room and board, it sounds a bit niggardly to give her just enough feed to keep her alive during the six or eight weeks that she's dry. Anyway, the fact that liberal feeding of a dry cow will increase her production during the next lactation period, makes such a practice a good business proposition.

The first thing, of course, is to dry up the cow. Many animals have inherited such a strong tendency to produce milk that they'll keep on producing right up to freshening unless their owner does something about it. Dairymen are less afraid to dry off a cow quickly than they once were. Some even go so far as to say that it's safe to stop milking any cow that's not giving over twenty pounds of milk a day. Cutting off the grain ration abruptly, putting the cow in the barn and feeding her hay if she's on pasture, and reducing her water supply, if that's necessary, will dry off the most persistent producer in a short time. It is important, however, to milk her completely dry if it becomes necessary to milk her at all. Otherwise mastitis may get a foothold.

A dry cow needs less food than one that's producing heavily, but the aim should be to feed her enough to add one hundred to two hundred pounds to her weight while she's dry. The basis of the dry cow's ration is good hay. Feed them all they'll eat. There's no question but that a cow will eat more hay if she's fed several times a day rather than twice.

Many dairymen think that it's wise to cut down the amount of silage to about half the amount she gets when she's producing. A cow may maintain her weight on plenty of good hay and silage but you can't expect her to put on weight.

A dry cow needs less protein than a milker. A grain ration with 12% protein is plenty high, and if she's getting good clover or alfalfa hay she'll do all right on a ration made up entirely of homegrown grains. One difficulty is to get a homegrown ration that is light enough. Ground oats will lighten the ration, and another

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way that's been suggested, if you grow corn, is to grind it ears and all. There isn't much nourishment in corn cobs, but it does lighten up the ration.

How much grain does a dry cow need? With good roughage, she'll need at least three to four pounds of grain a day if she's to put on weight and get into condition to produce heavily when she freshens. Some recommend between five and ten pounds of grain a day, depending on the size of the cow and her condition.

There is considerable evidence that a high-producing cow puts more minerals into her milk than she eats. The balance is taken from her body, particularly from the bones, and during the dry period if enough minerals are provided in her feed, she builds them up again.

Commercial feed manufacturers have been doing a good job of supplying minerals in the ration, but if you're feeding a home-grown ration, it will be wise to feed additional minerals. The most important of these are salt, calcium and phosphorus. A simple mineral mixture that has been suggested is one hundred pounds of bone meal, one hundred pounds of finely-ground limestone and one hundred pounds of salt. If salt has not been added to the grain ration, double the amount of salt in this mineral mixture. For dry cows this mixture can be put into the grain ration at the rate of two pounds to ninety-eight pounds of feed, or it can be fed in a box to which the cows have access. The salt will induce them to eat it if they really need the minerals.

The evidence that it's profitable to feed cows liberally when they're dry is conclusive. Many a dairyman will say that he can get more milk from a pound of feed fed to a dry cow than he can from the same feed fed to a thin, fresh cow. With all the talk about an impending feed shortage, and it's not just talk either, dairymen may be tempted to ration the grain given the dry stock. Don't do it unless it's absolutely necessary. Before you do it, put some study on the herd. You may find a boarder or two who isn't paying her keep, or you may find that you're feeding some of the poorer producers more grain than they can use efficiently. When it becomes necessary to cut down on the amount of grain fed, give the dry cow her share. She's entitled to it, and she'll pay you for it.

The Russian Farmer

Condensed from Kansas Farmer

WE read more and know less about Russia than any other country in the world.

In Russia, as in America, the farmer is the backbone of the country's social and economic life. What kind of fellow is the Russian farmer? How does he live? How did the collective farms originate and how do they operate? These are just a few of the questions that arise in our minds when we think of Russia.

It is the group spirit of the Russian that has led to collective farming, and that has sustained him thru the terrors and ravages of war, states the Russian War Relief, which adds: "The Russian farmer never was a rugged individualist in the American sense. He never lived in isolation from his fellows."

In considering the history of the Russian farmer we must remember that most of the peasants were serfs on the great estates of the landed nobility until 1861. In that year the serfs were freed and allowed to acquire land and work their way up.

But "working one's way up" to the status of an independent farmer was not an easy matter in feudal Russia: 50 per cent of the land remained in the hands of the nobility and the church until 1917, another 20 per cent in large estates; and vast numbers of peasants, left landless by their emancipation, went to the cities in search of factory jobs, while other millions remained tenant farmers.

Only a very few came to own any but the smallest strips of land. Meanwhile, as in the days of the serfs' quarters, country life still centered around a closely-knit community. The farmer's fields might lie miles away, in a half dozen scattered patches, but his home and barn were built in the village.

Russian agriculture remained a century behind the times. Farmlands were a patchwork of tiny strips, tilled by 4,200,000 wooden plows, 17,700,000 wooden harrows and the backbreaking toil of poor peasants, who could scarcely afford a horse, much less a truck or tractor. In every 10 years between 1845 and the revolution there was a famine.

This was the agriculture the Soviets inherited. It was scarcely a firm foundation for a country predominantly agricultural. How to bring the farms up to modern standards was the problem. Col-

Reprinted by permission from the Kansas Farmer, Topeka, Kansas, Oct. 16, 1943

lective farms, on which individual farmers could pool their land, equipment, and labor on a share-the-profits basis, was the natural answer in a country where group effort already was established.

At a great cost in human suffering, and with many serious mistakes the inexperienced Russians set about transforming their farms. In 10 years they merged some 25 million individual farming strips into 250,000 collectives, and added thousands of acres of hitherto untilled land. Today the collective farms average 1,200 acres under cultivation, and 75 families to the farm. Altogether, they number 19 million families and till about 90 per cent of the country's fields. The idea proved so popular that, by the start of the war with Germany, individual farmers tilled less than 1 per cent of the land.

The government advanced funds for purchase of equipment by the collectives on long-term loans, and set up a network of 7,000 Machine and Tractor Stations to perform the mechanical work under contract. Together with scientific farming methods and irrigation projects, the machinery of these stations and of the collective farms revolutionized Russian agriculture and broke all crop records.

In 1913, under the czar, the record grain yield was only 2,937,267,000 bushels. By 1937, collective farming brought a harvest of 4,390,400,000 bushels. Under the czar it took 38 man-hours to produce one metric ton —36.67 bushels—of wheat. Under collective farming it takes 1.7 man-hours. Productivity of the soil rose 30 per cent while the sown area increased by the same percentage.

Altho collective farming has brought new prosperity to the Russian farmer, his home has changed little with the years. It still is a wooden building in the village, with a barn attached, and fretted woodwork on eaves and window frames. Inside his home, which is his private property, there is the same huge tiled Dutch oven, jutting into each room thru the central partitions, and as familiar in the Russian farmhouse as the pot-bellied stove used to be in America. He has added light and power, however, and a radio.

A third change from the past is a bookshelf. At the collective farm clubhouse, the illiterate Russian peasant has learned to read and write. His children go to college—there are 56 agricultural colleges. For his small children there is a collective farm nursery. And the villages have maternity homes and hospitals.

Some collective farm villages possess professional theaters with actors trained in Moscow and Leningrad. Hundreds of villages

are visited each year by theater troupes, and 20,000 possess motion picture theaters. About 100,000 collective farms have clubhouses, with game rooms, libraries, auditoriums and classes in subjects ranging from agronomy to zoology.

The village store, a co-operative, is very similar to the old-fashioned American general store. On Sunday the religious go to church; in the afternoon the young people play games in the village square. Young people attend a 7-year elementary school and may spend 3 more at high school. Most of them belong to the Young Pioneers, corresponding roughly to our 4-H Clubs.

Once a year an annual membership meeting of the collective farm is held, when the accounts are presented, net income divided among members, new officers elected, plans laid for the coming year's work, and new members admitted by majority vote.

Division of the farm's net income involves complicated bookkeeping. After the harvest is calculated, the Machine and Tractor Station is paid in produce for its work. At the same time the farm turns over to the government a share of the crop at a fixed price. In 1939, 14.3 per cent of the collective farms' grain crop was sold to the government under obligatory fixed-price sales.

After settling with the machinery stations and the government, the farm has about two-thirds of the harvest left for the collective and its members. A portion is sold to purchasing agents of co-operatives or food trusts and the cash used to repay loans to government banks, to pay for fertilizer, improvements and new equipment. Government taxes, which average 2.8 per cent of income, may be paid in produce or cash.

The farm land is guaranteed to the collectives for all time without cost. No collateral is required for loans, which are advanced against future crops, and there is no right of foreclosure on land, farm equipment or possessions. Farm land may not be mortgaged, reduced or rented out.

Collectives can acquire additional land free if it belongs to no individual and is not being cultivated, and if they can present proof of ability to cultivate it. They must till the new land or lose title. They also can acquire land by admitting new members, who must give their land and holdings to the collective, but a landless farmer may apply for membership on an equal basis with others. Any farmer may resign from the collective but cannot withdraw his holdings.

After meeting its obligations the collective's net income, both cash and produce, is divided among the members according to

the type and amount of work each has done during the year.

For each job a certain amount of work is set as equal to one "share" in the farm's income. This share is called a "workday." All farm work is divided into 7 types, according to the skill and experience required. Each type rates a different valuation in terms of "workdays," ranging from one-half to 2 "workdays" for about 8 hours of actual work. In other words, a skilled tractor driver might earn 2 "workday" credits in the same number of hours a milkmaid took to earn half a credit.

At the end of the year some members may have as many as 600 or 700 "workdays" to their credit while others might have only 80 to 100, the minimum number required to share in the earnings. They receive payment both in cash and produce and are free to decide whether they use the produce in their own kitchen, turn it over to the farm administration to be sold for them, sell it themselves to purchasing agents who tour the country, or take it to the city markets to sell directly to consumers.

After he earns his minimum number of "workday" credits, the farmer may spend the rest of his time earning additional credits, or, if he prefers, tending his own private garden. Each collective farmer may own up to about 3 acres of private garden, 3 cows, 25 sheep, 3 pigs, an unlimited number of rabbits and poultry, and 20 beehives. These and their produce he does not have to share. To help farmers acquire this inventory the collectives are encouraged to sell surplus stock to their own members.

Another important factor in Russian agriculture is the state farm. This is a government-owned and operated institution employing its farm workers like a factory. There are about 4,000 of these state farms, which constitute about 10 per cent of the tilled soil. Some are operated as subsidiaries of restaurant and grocery chains, hospitals and similar institutions; most of them, however, are owned and operated by a special Commissariat of State Farms.

A major function of the state farms is experimental work, and in this respect they resemble our state experimental stations. Their experimentation, conducted on a vast scale, has broken the ground for new crops like Russia's rubber-bearing dandelion, and has been of inestimable value in "evacuating" old crops to new regions, such as the "evacuation" of sugar beets from the captured Ukraine to Kazakhstan. The state farms' guidance has been helpful to the collectives in many ways.

The collective farm system,

with its many advantages over the old days of serfdom, has given the Russian farmer a new confidence in his ability and position in the scheme of Russian life. It is this confidence that has given him the courage and determination to fight on and on under almost insurmountable difficulties. He now has the will to win and will win against the attempt of Germany to wrest from him his new-found right—the right to the fruits of his toil on Russian soil. We wouldn't want collective farming here in America but it apparently works well in Russia.

Only thru understanding of the Russian farmer as an individual and as a citizen of a great country can we work with him for the mutual benefit of all the countries of the world.

A "War Floor" for Poultry Houses

Condensed from Successful Farming

WHEN Sam and Frank Honegger, of Forest, Illinois, set out to build a poultry house on the Honegger farm, they didn't realize that they were going to come up with a solution to the flooring problem which may well prove a boon to economy-minded poultry raisers.

The floor which they developed for a new building to house pullets is made of ground limestone, spread to a depth of six inches over firmly packed soil and covered with a deep litter. "Not only has the floor reduced costs and labor in construction," says Sam Honegger. "but we can salvage the floor when we're thru with it." He refers to their plan to take the limestone out with the litter when the house is cleaned for a new crop of birds. Together with the litter, it will be spread on the farm as fertilizer, and a new limestone floor will be laid.

The floor of the house was filled in with dirt to within about six inches of the top of the foundation and tramped down. Then the limestone was spread over the top, dampened, and tramped down. The built-up litter plan is being used in the house.

"Limestone beats the other stop-gap floors, such as clay, sand, or cinders that have been tried," says the Honeggers, "because it doesn't hurt the soil when it is spread with the litter as fertilizer. And most land needs some lime anyway."

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Cereal Grain Hay

Condensed from Nebraska Farmer

Tom Leadley

DRIVE into the Archer, Wyoming, Experimental Station farm on the high plains a few miles east of Cheyenne and you will see several stacks of roughage around the barns and feed lots any day of the year. Poke into the stacks and pull out a sample and you will find that most of them are small grain hay—wheat, barley, oats or rye—cut green, and always enough on hand for a year or more ahead.

That is the way Superintendent A. R. Nelson insures winter feed supplies for dairy animals, sheep, and horses, and at the same time provides them a high-protein hay and makes small grain a dual purpose crop—that is, grain or hay.

At a time when protein shortages have farmers and feed men in a dither to find substitutes for this very necessary element in efficient livestock, dairy, and poultry production, the use of small grain for hay and for grass silage has distinct value and possibilities. It offers a way for farmers to grow their own protein feeds from a part of their small grain crops and insure a roughage supply, from a crop that frequently runs afoul of damaging dry weather or hail after it passes the hay making stage.

Since small grain hay, cut preferably in the late boot or early heading stage for highest protein content, compares very favorably to alfalfa hay in protein, its value can be readily ascertained. With alfalfa selling at $20 to $25 a ton on the terminal markets, the importance of small grain hay increases.

Superintendent Nelson has been a militant missionary in trying to sell the Great Plains farmers on the value of cereal grain hay. His first work with it began in 1926. During several years of trial, he had had no reason to lose faith in it as a good farm grown feed crop. The cereal grain hay can be cut with a binder or mowed and stacked. He prefers the latter.

The Wyoming Experiment Station is a high altitude farm, approximately 5,000 feet, which means that conditions may be more favorable for production of a high-protein cereal, and also that small grains grown on summer fallow land, as is the practice there, are more likely to produce

Reprinted by permission from the Nebraska Farmer, Oct. 16, 1948

a satisfactory growth for haymaking than in hotter sections of the plains. For example, note these average hay yields and protein content from the several cereal crops harvested as hay in 1941 and 1942 at the Archer Station:

Crop	Hay (Pounds)		Percent Protein
Common Winter Rye	3471	1942	16.06
Dakold Winter Rye	3407	1942	13.65
Rosen Winter Rye	3348	Aver. '41, '42—	17.14
Kanred Winter Wheat	4442	Aver. '41, '42—	12.59
Spring Rye	1734	Aver. '41, '42—	16.39
Horn Barley	3988	Aver. '41, '42—	17.57
Markton Oats	3321	.....	
Archer 59 Spring Wheat	2895	Aver. '41, '42—	16.44

The United States Department of Agriculture Year Book credits alfalfa hay with 15.93 percent protein content. At the prevailing alfalfa hay prices, cereal hay is worth quite a bit of money, sometimes as much or more than it would bring as a grain crop.

Of course, hay isn't the only requirement to raise livestock successfully in the Plains country; there must be pasture for the summer months. The grass work at the Archer Station has been planned to give some practical aid in getting back to grass cultivated land that never should have been broken up. Crested wheat grass and Russian wild rye show the greatest promise, according to Superintendent Nelson.

Last year crested wheat grass produced three to four times more pasture than native grass. It comes on as early in the spring as winter rye and lasts until the middle of June. Russian wild rye provides a good growth of leaves that stay green until late in the summer. It grows tall enough to cut with the binder when harvested for seed. Dependable grasses of this kind are essential in getting wheat farmers back to livestock, says Mr. Nelson.

Crested wheat grass pasture has produced 156 pounds of lamb per acre on the Station farm. No tests have been made with cattle, since the Station doesn't have enough range for them. Nelson finds that it pays to run sheep on 586 acres and that they can be sure of enough feed in the form of pasture, silage, cereal hay, and grains. Winter and early spring are the problem months with livestock in that area. That's where the cereal hays come in.

Summer fallow methods and equipment at the Archer Station are of interest. An eccentric one-way is used for the first tillage about the first of April. The best yields have come from this practice. From later tillage a smaller yield can be expected. The eccentric one-way was originated at the Archer Station. Every other disk is an eccentric arranged so that the spiral runs backwards.

This prevents the formation of a furrow.

The summer fallow land generally requires three tillages, twice with the eccentric one-way, and then a rod weeder. The wheat is seeded about September 1. Kanred is the standard variety used and yields about 22 bushels on the average on early tilled summer fallow land. The Peacock tillage machine has given slightly smaller yields and the duckfoot a little below that.

Deep tillage is out of the question in that section, says Mr. Nelson, but Mr. Nelson doesn't try to keep all of the trash on the surface. Pitting the surface with the eccentric one-way prevents water run-off, kills all weeds and makes the land more easily handled. The wheat is seeded with a deep-furrow drill. Wheat on summer fallow averages 50 percent more than on continuous cropped land. From three to four inches is deep enough for any tillage, in the opinion of Superintendent Nelson. While they used to plow six and seven inches deep with moldboard plow, the one-way proved a better machine, and as proof of it there is land on the Station that hasn't been plowed with a moldboard plow since 1919.

Cow Efficiency

Condensed from Holstein-Friesian World

Roland Ramsay

WE have received many letters from all parts of the country showing the very great interest fellow breeders have taken in our "Cow Efficiency" program. In view of this widespread interest we are preparing this article for the benefit of those who might care to adopt what part of our program seems to fit their own individual situations.

We realized that any feeding program that varied so much with the generally accepted theories of feeding would not easily be understood or accepted by dairymen in general, and here again we say we may be wrong, although in the light of our years of trial we are satisfied that there is a very vital fact which we call "cow efficiency" which enters into the picture of breeding dairy cattle, and we believe our system of feeding has proven to be a pretty good way to measure it.

Almost everyone that writes us

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seems to take it for granted that there is some secret we are withholding from them. They can't seem to realize that cows could make such profitable production on so simple a ration, so again we are stating that we feed ALL our cows this simple basic ration, and we again state that this ration contains all the requirements (according to Morrison's "Feeds and Feeding") that a 1600-lb. cow requires producing 50 lbs. of 3.5 to 4% milking.*

40 lbs. corn silage
30 to 35 lbs. alfalfa hay
10 lbs. ground corn and oats

We call it our "basic ration" because even though we sometimes vary the exact combination of feed, we aim to always feed a ration that contains about these same quantities of digestible protein and total nutrients. In some of our dry years, for instance, when we had very little alfalfa hay, and hay was high in price, we fed up to 60 or 70 lbs. of silage and down to 15 lbs. of hay. In that case we of course added just enough soy bean meal or linseed meal to bring the total digestible protein back up to the amount in our standard or basic ration. Likewise when bran is cheaper than ground oats we substitute bran for some of the oats; also we sometimes interchange barley with corn and quite often feed the corn in the form of corn and cob meal mixed with bran or oats, but in all cases our "basic ration" is the line we hue to and is the feed that is most commonly fed. The point that seems to be the hardest to get across is the fact that we normally feed NO high protein concentrate (except in rare cases when we are forced to cut down on alfalfa hay and feed much more of the low protein silage).

The reason why we feed all our cows the same amount, even though it runs contrary to all we have ever read or heard, is this: When a cow is first fresh and wanting to produce 60 to 80 lbs. of milk per day, holding the grain down to 10 pounds, tends to discourage dangerous production for 2-time milking, and we consider all twice-a-day production much over 60 lbs. too much strain on the cow and udder to be safe. The sooner she gets down to 60 to 50 lbs. which is what an efficient cow can produce on the ration we give her, the longer she is able to sustain this rate of production. Then during the last two months of the lactation feeding MORE than is actually required, tends to encourage the cow to as much

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**Editor's Note: The Ramsay herd has a 12-year herd average in HIR of 11078 lbs. milk, 3.8%, 417 lbs. fat. No other herd listed in the Red Book can show as high an average for 12 consecutive years.*

tail-end production as is possible, and the unused portion of the ration goes to the conditioning of the cow and to the nourishment of the unborn calf. Likewise, our basic ration puts the cow in splendid condition for her next lactation as well as nourishing a strong, healthy, normal calf. So after all, we think there is plenty of logic in such a system, especially where the cows are fairly uniform as to producing ability.

We feed our younger cows at the same grain rate as the mature cows (also same silage) but as we feed hay at will, the younger cows are unable to handle quite as much hay as our "basic ration" indicates. The reason why we offer them the same ration is because in addition to their production we feel the 2- and 3-year-olds need the extra nutrients to take care of the growth and development they continue to make while coming to maturity, and this, too, after 13 years' trial seems to us to prove out to be logical.

Let us illustrate what we mean by measuring "Cow Efficiency" with this simple comparison: In Nebraska, according to law, no tractor can be offered for sale that has not been officially tested by the Engineering Department of our State College. Every model of every make tractor is given a uniform test and the results are published and accepted by not only Nebraska, but practically every state in the union. First the tractor is a stock model, and is limbered up and carefully adjusted by its makers. The governor is adjusted so that the motor runs exactly the number of R.P.M. the machine is built for. Then by a system of brake tests the belt and drawbar power is measured and the power developed per gallon of fuel recorded.

We know that a cow and a tractor are two different "animals" but there is quite a lesson for cow men in this tractor test. Before the test was required. any manufacturer could rate his machine any way he chose. He might claim greater power than he had by speeding up his motor way past recommended R.P.M., or he might put in a power plant with plenty of power but that required 3 gallons of fuel to plow an acre. So it is with cows: if we buy breeding stock based on large records without any knowledge as to the amount of total nutrients and protein required to make this record, it is like buying a tractor without learning whether it takes 1 1-3 gal. or 2½ gal. to plow an acre of ground.

Feeding a cow too much protein is like running your car with too rich a mixture in your carburetor. You not only waste feed or gasoline but you damage your cow just as too rich a mixture di-

lutes your crankcase oil and eventually causes damage and expense.

We don't say that all 4-time records are worthless because too much good has come out of a judicial use of records made under these conditions. We simply believe that the 7-day record gave way to the 4-time yearly record because a 500-mile race is a better test for a car than a one-mile race. But who clamours for the same make car that wins the Indianapolis race when buying a car for a profitable investment.

We believe that the most profitable herd of Holsteins is one that regularly averages 400 to 500 lbs. fat under safe and sane feeding. To make such an average it means that your mature cows must be of 500-lbs. fat calibre, they must be kept free from disease and bred to freshen as near once each 12 months as is possible. After all, too much attention has been and is now placed on the production column instead of where it belongs on the profit-above-feed-cost column. When we arrive at the point in our thinking where we realize that to breed profitable cattle we should turn for seed stock to breeders of efficient, profitable cattle, we will have fewer disappointments. When we as breeders realize that the only real excuse for us to set ourselves up as breeders is to supply others with seed stock that is more "useful" and efficient, then we will again justify the faith dairymen should have in us.

Feed-Saving Device

There have been times in the last 6 months when good poultry mashes were hard to get. With the grain situation getting tighter and tighter, it may be still harder to get in the future, so waste cannot be tolerated. Dwight Ballard has a feed-saving device for his brooder house in Eaton county, Michigan, that might be adapted to the laying house where hens are inclined to throw mash out of hoppers with their beaks. Ballard cut strips of 1-inch mesh poultry netting to fit inside his feed hoppers. He fills the hopper, then puts the strip down on the top of the mash. The wire forces the bird to peck straight down, instead of bringing down the beak with the back motion that throws feed out of a well-filled hopper.

—Capper's Farmer

Pit Storage of Potatoes

Condensed from Pennsylvania Farmer

J. B. R. Dickey

STORING potatoes in the ground, especially those kept for seed, is not new. No special equipment and no cash outlay is needed. If properly done, the tubers keep in ideal condition, firm and unsprouted till late into the spring. The potential capacity of such storage is practically unlimited.

A house cellar with a furnace will never keep potatoes in good condition very long; it is too warm and dry. Even where there are simply heated rooms overhead the cellar temperature is generally too high for good seed storage. When the weather begins to warm up in the spring almost any cellar gets too warm to prevent an undue amount of sprouting. The first sprouts are always the best and the strongest. If they must be broken off before planting the crop gets off to a poorer start. Tests comparing seed kept in what would be considered a satisfactory cellar with the same stock properly pitted have shown differences in favor of the pitting up to 60 bushels per acre. Not only is pitting desirable for seed, but some commercial growers with inadequate storage bury thousands of bushels of table stock every winter.

One might think that extensive pitting would require quite a hole and involve a lot of digging. This depends on the shape of the pit. The simplest and most satisfactory type is a shallow ditch, seldom over ten inches deep, or over four feet wide. It can be made as long as necessary, figuring about five bushels per running foot of pit. One grower last fall buried 3,000 bushels in one pit 550 feet long. In the spring the grader was dragged along the bottom of the pit and the potatoes were shoveled directly into it as they were uncovered. In such a pit internal heat is not likely to develop and no ventilators are needed. In digging it most of the dirt can be plowed out, finishing the job with a small scraper or shovels. The soil should be plowed or scraped back a foot from the edge of the pit.

Most people worry about keeping pitted potatoes from freezing. If the job is properly done there is little danger of this. What should have first consideration is to have the tubers buried just as cold as it is safe to have them.

Reprinted by permission from Pennsylvania Farmer, Pittsburgh, Penna., Oct. 23, 1943

If they are then properly covered they will stay at the desired low temperature late into the spring. If they go in warm they will stay warm and soon start to sprout and heat and often be ruined. If they must be pitted as dug, potatoes should be simply covered with vines and left that way until they are quite cold before putting on the winter cover.

The potatoes are piled in the pit as high as they will lie without rolling out. When ready for the final covering about a foot of dry straw is spread over them evenly and covered with 6 inches of soil. The straw should be drawn out well at the ground line to prevent frost working in through the undisturbed soil. The final layer of soil should be patted down with the back of a shovel and watched for a few weeks for cracking due to the settling of the straw. The cracks should be carefully filled. One thick layer of straw and soil may be adequate in a mild winter, but two are much better and safer.

The pit should be located on well-drained land, preferably with enough slope to prevent water from collecting in it. If on plowed land or in the potato field it will be easier to get loose soil for the covering. A few furrows drawn around the pit during the covering will give more loose soil and will lead surface water away. Manure should never be used to cover a potato pit since it will heat and warm up the tubers at the time when they should be kept cold. With a long narrow pit it is easy to take out part of the potatoes and then close up the end and leave the remainder as much longer as desired.

Yeast Reduced Milk Fever

Maybe irradiated yeast can reduce dairy losses resulting from milk fever. Two years of work with Jerseys at the Ohio Station indicate that yeast may help to prevent this after-calving-time trouble. More work is to be done before the Ohio folks make a flat statement, but here's what has happened thus far:

In Jerseys with previous histories of milk fever, the feeding of one million units of vitamin D in the form of irradiated yeast daily for four weeks before and one week following freshening was effective in preventing about 50% of the cases, as compared with a control group. Data on other breeds are insufficient to draw any conclusions.

—Farm Journal

The Little Farms Speak

Condensed from Farm Journal and Farmer's Wife

Romeyn Berry

PEOPLE have been saying that little family farms don't count any more; that it's only the big, factory farms whose product can be depended on to feed the army and everybody else, to supply the food statistics that experts must have to do a good job of guessing about food shortages.

My wife and I don't believe it. Our farm is just a little one of 65 acres, and we run it the old-fashioned way with horses and bare hands. And my wife and I have been farming no more than seven years. That, of course, isn't big enough, or long enough, to qualify us to get up and speak in meeting. We ought to take a back seat and hold our peace. But there are times when even a newcomer feels he must say his say, both for himself and for a million other little farms, through the hills and up and down the dirt roads.

It is true that we tally our output in dozens and bushels and pounds—seldom in tons, never in carload lots—and that most of the things we take to town get eaten up right there without going on to Boston or Belgorod, or into the government statistics.

We drive to town twice a week with a back seat full of eggs, cream, sweet butter and dressed chickens—on seasonal occasions with strawberries, new potatoes, sausage and bacon. And nobody can tell my wife and me that it doesn't count—count a little bit, anyway, in the common effort—even though the experts never get around to checking what we carry in the back seat.

When the Ohio River goes over its banks and floods the bottom lands, it looks, no doubt, to the official observers as if the Ohio River were doing the job all by itself and supplying its own water. But it isn't. All of that yellow flood fell as simple drops of rain on little farms back in the hills, and from there worked down through the rivulets to the brooks. And the Ohio River would not long be able to float a healthy catfish, but for the rivulets and brooks fed by the rain that fell on little hill farms.

What is true of the rivers of water is true in part, we suspect, of the floods of food that are now floating down to the docks and depots. It's a flood, now, but

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much of it was just dozens and bushels and pounds back on the farms of less than 100 acres where it started.

But if you still think what we take to town twice a week is inconsiderable, regard the negative of the proposition—the food we *don't* purchase, and thereby release for the use of Pittsburgh, San Francisco and General Eisenhower. There's never much food on the back seat when we drive home from town, and we seldom have to bother the harassed young woman at the store for anything more than coffee and sugar, some special products, or an occasional box of smokes.

Our farm is conducted pretty much on the pioneer, subsistence basis. "Raise everything you need. Eat just what you raise, or go without. Sell only your surplus." We don't wholly accomplish that lofty purpose, but we come pretty close. What we eat comes from the barn, the preserve closet, the freezing box and the root cellar mostly.

Nor am I speaking only of my wife and me. There are also Charlie Simmons, Little Butch and Kay Jean, our recruit from the Women's Land Army, whom Washington doesn't have to provide for, and who use their coupon books only when somebody needs a pair of shoes. That makes five people our farm is taking off the market. Multiply all that by X = million other places like ours.

We don't have to worry—or worry the dealer, either—about new parts for the tractor when old ones wear out in wartime. That's because we haven't any tractor. Our power plant is a team of mares, and these, in addition to doing our work, supply their own spare parts and replacements. There are three such replacements down in the back pasture at the moment.

We shall have a team of young horses born on the place, to sell in the spring, or to step into the breach if anything should happen to Kitty or to Madam Queen. There are many times, naturally, when we wish we had a tractor; we will have when we can; but meantime we can derive some comfort from the thought that tractors do not enrich the soil, nor have little tractors.

Some of my wife's relatives thought we were pretty silly when we went on the farm seven years ago. None of us could have then foreseen food rationing on red and blue coupons. Since that started, the relatives have come around in a big way; come around mostly for a little bacon or a half-pound of country butter.

We too knew, seven years ago, that we were taking chances. But the thing has worked out all right, and if we had it to do over again, we'd do just about what we have done. Not that we'd rec-

ommend farming a little farm to everybody else. We can't imagine any worse life for people who do not like farming. But we like it.

We haven't grown rich, of course, nor did we expect to. The time has passed when anybody but a miracle-maker can get rich on a 65-acre farm up our road. But we've made a living, the farm is paid for, and we've plenty of cows, horses and pigs, practically all of which were born on the place and didn't cost anything in cash.

We're not too much worried about inflation or prices, because we've always been pretty dumb in economics, and can't see that the price of a thing makes much difference when you neither buy it nor sell it—just eat it, or feed it, or get along without it. And we like to believe that the farm is a better farm than it was when we took it. That means that if Little Butch still wants to be a farmer when he grows up, he'll have a not-too-discouraging place to start on.

Are Corn Cobs Good Cow Feed?

Condensed from The Ohio Farmer

Ray T. Kelsey

AN extra shot of just plain, everyday corn cobs in the daily menu of a lot of 20 white-face steers on feed at the Ohio Experiment Station at Wooster lowered their feed cost $2.68 per cwt. under the cost of gain for a like lot of steers that got the same ration except for ground shelled corn and no cobs.

There were three lots of 20 steers each in the feeding test. They all were fed the same ration with this exception: One lot was fed ground shelled corn; one lot ground corn-and-cob meal; and for the third lot they dumped the cobs from the shelled corn fed the first lot into the corn and ran the whole works thru the hammer mill to make what might be called corn-and-double-cob meal. In other words this third lot was fed just twice the normal amount of cobs in their corn-and-cob meal.

True, the lot which had the de luxe menu of ground shelled corn outgained the lot that had to eat a double shot of cobs by one-twenty-fifth of a pound per day but they lacked by one-fiftieth of

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a pound per day the gain that the group fed ordinary corn-and-cob meal made. They were a little more highly finished, a little sleeker and smoother, and the buyer recognized this when he paid for them 50 cents and 60 cents more per cwt. than for the others.

But the most important fact is that these steers had done well, had not gone off feed during the entire 252-day feeding period, on this double-cob ration and they had put on their gains for the least cost per cwt. That last fact is one which interests every cattle feeder. If he can get cheaper gains in weight, then he can operate on a narrower margin.

For a long time Paul Gerlaugh has been a strong advocate of corn-and-cob meal for feeding cattle rather than ground shelled corn, and a lot of old cattle feeders have been difficult to convince that there was any feed value to the corn cobs. Another member of Paul's department, Dr. Wise Burroughs, felt about the same way on the subject. They got to thinking that if a few cobs were good in the ration, maybe more would be better. Burroughs tried a little experimenting with extra cobs in rations for individual steers and they seemed to get along all right. So between them they thought up this feeding experiment with no cobs, normal cobs, and double cobs. They were half afraid it would "blow up" in a few months and the steers would go off feed or bog down in their gains but they didn't. They also gave three other groups of steers the same rations but fed individually instead of group-fed in the lot. The results were the same.

So these steers gave their answer to the question in the men's minds last week and it was in favor of the double-cob ration insofar as cost of gain is concerned. Finish and selling price were against them but not enough to offset the lower-cost-of-gain advantage.

Mr. Gerlaugh and his associates stated that they are not ready to go "all out" and recommend dumping a lot of extra corn cobs in your beef cattle ration. Research men and scientists never are satisfied to draw definite conclusions from just one test, they want it proved over and over again. They were, however, willing to give us the results of this one experiment as something for cattle feeders to think about. They are not promising that they can duplicate this test and get the same results in another year but they frankly stated that they could find "no holes" in the test as it was carried on. Maybe corn cobs are good for cow feed, after all.

Sericea is a Good Crop

Condensed from Better Crops With Plant Food

R. Y. Bailey

Chief, Regional Agronomy Division, Soil Conservation Service, Spartansburg, S. C.

AFTER a slow start, sericea lespedeza is steadily coming into its own as an important crop in the South. From 1896, when the first planting was made at the North Carolina Agricultural Experiment Station, until 1934 it was estimated that less than 2,500 acres had been planted to sericea in the seven Southeastern states. Since that time, the acreage in these states has been increased to more than 100,000 acres.

Slow progress during the earlier years was due largely to a lack of information about cultural methods, utilization for hay and grazing, and to the limited supply of seed. In many instances, unscarified seed was planted at such a low rate per acre and covered so deeply that very thin stands were obtained. Following the practice of mowing for hay when the plants were in bloom, used with most other legumes, the quality of hay was so poor that sericea was thought by many to be of no value.

The Bureau of Plant Industry conducted trials with sericea at the Arlington Experiment Farm, Va., and distributed small quantities of seed to state agricultural experiment stations and to individual farmers. Several of the state stations made studies of cultural methods and of utilization of sericea for hay and grazing. As a result of these studies, it was learned that better stands could be obtained from scarified than from unscarified seed, and that the seed required little or no covering. It was also learned that sericea made hay of good quality if cut while plants were still young and succulent. At the Tennessee Agricultural Experiment Station, sericea was grazed by livestock while the plants were young and succulent.

At several of the Soil Conservation Service demonstration projects and CCC camps, sericea was planted rather extensively for erosion control on steep slopes and in waterways into which water from terraces was discharged. In the spring of 1937, information from the Bureau of Plant Industry and the experiment stations was used as a basis for a simple

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set of planting instructions that were used in all areas where the Soil Conservation Service was operating. As further experience was gained with sericea, these instructions were revised. This method of planting consisted of sowing 30 pounds of scarified seed per acre following a cultipacker or a drag harrow on well-prepared soil without covering. Cultipacking and harrowing were done approximately on the contour to avoid drifting of seed in case heavy rainfall occurred soon after seeding. On very steep slopes cultipacking after sowing presses seed into the soil and reduces drifting.

Although the rate of seeding was somewhat heavier than might have been required under ideal conditions, stands were not too thick on the unfavorable sites where sericea was usually planted. Many of the farmers did not have the equipment needed to prepare good seedbeds, and there was often a loss of seed as a result of drifting and silting on the steeper sites. Uniformly satisfactory stands were usually obtained where this method was followed. Where sericea was planted on bare areas of raw subsoil, stands were greatly improved by light mulching with straw, damaged hay, or coarse manure.

Most of the seeding was done in April, May, and June, although sericea may be planted over a considerably longer period. Satisfactory stands have been obtained by planting scarified seed from early corn planting time, or a little before, through July. Good stands have also been obtained by seeding sericea immediately after the last cultivation of corn in July. In a few instances, drought immediately after seeding killed young seedlings before they established a good root system.

Larger yields of hay have been obtained the second year from early spring than from June and July seedings. Particularly on sandy soils in the Coastal Plains, better stands have been obtained from early than from late spring seedings.

Best stands of sericea have usually been obtained where it was sown on clean land without a nurse crop. Sometimes farmers got satisfactory stands by seeding on small grain early in the spring, but many failures also resulted from this method of planting. Particularly in the middle and lower South, dry weather in May has resulted in poor stands where sericea was seeded on grain. The maturing grain crop had drawn so heavily on soil moisture that a large percentage of the young sericea seedlings died before they could establish a good root system.

Satisfactory stands of sericea

have been secured by disking small grain stubble after harvesting, cultipacking, and then sowing sericea seed. Better stands resulted where the grain was mowed for hay so as to allow the sericea to be seeded a few weeks earlier than where the grain was allowed to remain until ripe. This method of seeding allows sericea to be planted without losing the use of the land for a year. The yield of hay the second year is not usually as large as it is from plantings made early in the spring.

Unhulled sericea seed has given good stands when sown the latter half of the winter. Unhulled seed is less dependable than clean, scarified seed. In order to insure stands that are thick enough to control erosion on sloping land, it is usually advisable to sow approximately twice as much unhulled as scarified seed.

Sericea makes little growth the first year. The young seedlings are usually practically hidden by weeds so that the crop appears to have failed. Farmers have been known to plow up good stands of sericea the first year because they thought the crop had failed. Plants make very rapid growth in the spring of the second season and are usually ready to cut for hay by the first to the middle of May. Mowing for weed control during the first growing season is not necessary, unless a dense stand of crab grass is present. If mowing is done, it is important that the cutter bar be run high enough to avoid cutting the sericea plants near the ground. A few instances have been seen where stands were practically destroyed by close mowing the first growing season.

Sericea requires well-drained soil. It will not grow on marshy land or on soils where the water table is very near the surface. It has grown on some of the heavy plastic clay soils that are not adapted to kudzu. Because of its ability to grow on soils with plastic subsoils, sericea is the best adapted perennial forage crop for soils like Iredell in the Piedmont and the acid clay soils of the Black Belt of Alabama and Mississippi. Sericea also grows well on some of the brown loams such as Grenada in north Mississippi and west Tennessee that are usually referred to locally as being too cold for kudzu.

Sericea has proved its value as a soil-conserving crop in steep, eroded land where it has grown satisfactorily with less lime and fertilizer than are required by most other forage crops. It is giving excellent protection against erosion on slopes and in waterways, provided thick stands are obtained. Thin stands have proved to be too open for adequate protection on steep slopes. Thick, uniform stands are abso-

lutely essential for protection against erosion on steep slopes or in waterways, and are highly desirable on all sites.

Farmers who mow sericea when the plants are about 12 inches high, rake soon after mowing, and store the hay in the barn the following day are usually well pleased with the quality of the hay. Cases of dissatifaction with the quality and palatability of sericea hay that have been investigated usually have been due to late mowing that resulted in coarse, stemmy hay, which retained only a small percentage of its leaves.

In a few feeding trials where alfalfa and sericea hay were compared in the ration of dairy cows, sericea was about 80 per cent as efficient in milk production as alfalfa. Any forage crop that will produce hay which is 80 per cent as good as alfalfa, on land that is too poor for alfalfa or most other forage crops, has a place in the Southeast. There is a vast acreage of eroded land in this section that is now producing little or nothing of value. Sericea, if planted on this poor land, would make a valuable contribution toward a livestock program in the cotton-producing states.

Yields of sericea hay have usually been from 1 to 2 tons per acre annually. Most of the land that was planted to sericea usually produced less than 15 bushels of corn per acre. On good land, yields of 3 tons of hay per acre are not unusual.

Sericea is a fairly good seed producer. Yields of unhulled seed have varied from 200 pounds to 1,000 pounds per acre. Seed production often is reduced by very dry weather during the late summer and fall. If harvested soon after frost, from 400 to 600 pounds of unhulled seed per acre may be expected. Seed shatter and may be lost if not harvested within a few days after the first killing frost in the fall.

Field-run seed usually yields as much as 50 per cent clean, scarified seed. The percentage of clean seed, of course, depends largely upon the amount of trash and leaves left in it by the combine.

The most satisfactory harvesting of seed has been where one cutting of hay was taken early in the spring and the second growth was left for seed. The height of the plants is more uniform and the stems are finer where one cutting of hay is taken than where the entire season's growth is left for seed production. In the latter case the stems tend to be too coarse to be handled satisfactorily by the small combines commonly used in the South.

Sericea is also proving to be a good grazing crop. It is especially valuable for spring grazing when

permanent pastures fail because of drought. Cattle and work animals have grazed sericea when they were turned on it while plants were succulent. They have not usually grazed sericea if turned on after plants were 12 inches or more in height. Farmers who have pastured sericea clipped it occasionally if plants reached a height of 12 inches. New growth following clipping was more palatable than the older growth. Sericea has also been grazed in the fall following summer mowing for hay.

The possibilities of sericea as a deep-rooted legume to control erosion and increase productivity of the soil in soil crop-conserving rotations have not been fully explored. Increases in crop yields following sericea in a few trials in the field have been very striking.

T. L. Smith, Route 5, Greer, S. C., plowed 1¼ acres of sericea and sowed barley in the fall of 1941. He fertilized the barley in the fall with 300 pounds of 4-8-6 fertilizer per acre and in the spring with 125 pounds of nitrate of soda per acre. The total yield of barley in 1942 was 120 bushels, or 96 bushels per acre.

There is little definite information about the fertilizer requirements of sericea. It has grown vigorously without fertilizer on moderately productive soils. On some of the poorer soils, sericea has made unsatisfactory growth without fertilizer. Even on the better soils where it was not fertilized, the stands were often thinned and broomsedge encroached after sericea was harvested for hay over a period of 2 to 3 years. Applications of fertilizer have increased the vigor of plants in several depleted stands to such an extent that broomsedge that had come in was crowded out.

On very poor soils, applications of 400 to 600 pounds of superphosphate per acre have been very beneficial in getting stands well established. Little is known about the potash requirements of sericea, but it seems logical that on soils where potash deficiency is indicated by cotton rust or other signs of potash hunger, potash also will be needed. Nitrogen has been distinctly harmful when applied before planting, particularly on soils of moderate productivity. Nitrogen from manure, commercial fertilizer, or winter legumes turned before sericea was seeded has stimulated the growth of crab grass to such an extent that it has bedded down on the young sericea plants. This heavy layer of crab grass completely smothered sericea plants so that spots several square feet in area were bare the following year.

Lime has not been very gen erally used on land where sericea

has been planted. Increased yields of hay have been obtained where lime was applied on very acid soils. It seems logical that sericea may respond to liming in about the same way as the annual lespedezas. Additional information about the fertilizer and lime requirements of sericea on the different soils is needed.

Although there has been a gratifying increase in the acreage planted to sericea during the past 10 years, there is still a need for many thousands of acres of this deep-rooted, hardy perennial. There is a very extensive acreage of eroded, depleted land in the Southeast that must be completely rehabilitated before it will make any substantial contribution to a better agriculture. Sericea has shown marked ability to grow on these depleted lands and to restore their productive capacity as hay, pasture, and cropland.

Feeding Soft Corn

Condensed from The Michigan Farmer

George Brown
Head of Animal Husbandry, Michigan State College

THE problem of utilizing soft corn to the best advantage will confront many farmers this year. This is an especially vital problem in view of the shortage of all feed grains.

In no case should soft corn be allowed to spoil if livestock can be obtained in sufficient numbers to utilize it. The feeding value of the dry matter in soft corn is practically equal to the dry matter in mature corn. Corn starting to dent will run from 50 to 55% moisture. On the basis of 55% moisture it would have a value 52% of that possessed by No. 2 shelled corn which has 15% moisture. If it contained 50% moisture, its value would be 58% that of No. 2 corn and if 40% moisture, a value 70% that of No. 2 corn.

Corn starting to dent and as low as 50% in moisture would dry down enough to make cribbing corn if weather conditions during October are favorable. In the feeding of soft corn one should bear in mind that its value is less than that of hard corn and that great quantities are required to produce a given amount of gain with livestock and that best results are obtained when the soft corn can be fed in combina-

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tion with some other grain, thus reducing the bulk which the animal must consume.

On those farms, however, where there is an excessive quantity of soft corn that cannot be dried down to be put in the crib and a limited number of animals available, it can be fed in large quantities to both cattle and hogs with the use of other grain. With extremely soft corn, it is desirable to utilize as much as possible of it before freezing weather. The fact that soft corn may become moldy should not in the least deter anyone from making maximum possible use of it for hog feed and as a rule, such corn can be fed to cattle. Perhaps the most satisfactory method of utilizing this corn is to feed it as shock corn. Where labor is scarce, either cattle or hogs may be turned into a field of soft corn to harvest it standing. Both sheep and horses are more susceptible to digestive disturbances than either cattle or hogs; hence, the use of corn containing a high percentage of moisture with these animals is not desirable and in no case should horses or sheep be fed soft corn which is moldy.

An estimate of moisture in corn may be obtained by picking a few ears, weighing them and place in the sun to dry and then weighing again.

On farms where large acreages of corn are grown and a silo is available, soft corn might be utilized as ear corn silage, picking the ears and ensiling both the ears and husks. This material must be chopped rather fine and thoroughly packed in the silo to insure its keeping in good shape. Small areas would not produce enough ear corn silage to fill a silo nor give enough depth in a large silo so but what a considerable portion would spoil at the top and in this case, it might better be ensiled with the stalks. In ensiling ears beyond the milk stage, some extra water must be added at the time of filling.

No Sore Necks Now

Donald Pharis weighs but 155 pounds, not enough to counterbalance the weight of a mower tongue. His teams in Clay county, Missouri, used to develop sore necks at haying time. He decided to give himself a bit more leverage, so lengthened the section of spring steel on which the seat is mounted and moved the seat back one foot. That eased the weight on the necks of the team and had an unexpected benefit—the seat from then on was springier and easier on the operator.

—Capper's Farmer

The Blood Spot Problem

Condensed from American Poultry Journal

Ralston R. Hannas

THE question of blood spots is always one that is of live interest to poultrymen and flock owners. It is particularly important to poultrymen who sell their eggs direct to city consumers, for they are the ones who get the "kick back" when a consumer finds an egg containing a blood spot that has been overlooked in candling.

It is always difficult for the poultry raiser to explain to the city consumer just what a blood spot is and that there is little or nothing he can do to prevent them in the eggs his chickens produce. In spite of the fact that some of these blood spots may be cut out of the egg and the rest of the egg used, the number of eggs spoiled for human consumption by the presence of blood spots is high, and in fact, runs into the millions each year.

It has generally been believed that the cause of these blood spots is the rupture of a small blood vessel at the time the egg breaks away from the ovary and drops into the oviduct and that among the things that cause this ruptured blood vessel is frightening the hens before the eggs are laid. These have been beliefs, however, and were not substantiated by facts. At the present time, at least two agricultural college and experiment stations are studying blood spots in eggs and have been for several years. They are the University of Illinois and Rutgers University (N. J. Agricultural Experiment Station). While the work has not been completed at either of these stations, some interesting facts have been obtained at both of them.

A recent preliminary report from the New Jersey Station gave three results that have been arrived at. It was found that blood spots are hereditary and that the environment affected the percentage of blood spots—for example, there were less blood spots obtained when birds were kept in cages than when birds were kept on floors, and lastly, that frightening chickens at different hours of the day did not increase the number of blood spots in the eggs produced during the frightening period.

The work is being continued at

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this station and birds that for the first year were kept in batteries will be transferred to floors, and those that were kept on the floors will be transferred to batteries. Professor F. P. Jeffrey, who is conducting these investigations, will pay special attention to the fatness of the birds and the number of blood spots produced, that is, not the weight of the birds alone but the percentage of fat, possibly the percentage of abdominal fat in the bird.

The Illinois investigators, Drs. Card and Nalbandov, at Urbana, where the work has been in progress several years, also find that blood spots are hereditary. They found, too, that the hemorrhages, resulting in blood spots, are caused before the egg leaves the ovary rather than at the time the egg leaves the ovary as many have previously believed. They also found that blood spots are not the result of vitamin deficiency, for vitamin treatments have all been negative.

It is interesting to note, too, that these investigators have found that a meat spot is a degenerated blood spot. Many people have thought that meat spots were pieces of tissue and had nothing to do with blood spots. However, this work has shown a definite relation between meat spots and blood spots. The change from blood spots to meat spots is due to a change in acidity of the hemoglobin in the blood. The change takes place at body temperature. These spots change from red to brown and finally to white.

The work is being continued at the University of Illinois and one of the things that will be studied this year is the possibility of the effect of blood pressure on the incidence of blood spots.

There seems to be no effect of blood spots on the hatchability of the eggs as determined by the Illinois work.

About the only thing of a practical nature that can be mentioned about blood spots at the present time in addition to the fact that the progeny of certain hens continue to produce eggs with blood spots, is the fact that there is a decrease in the number of spots when birds are let out on range. Poultrymen can use this as one means of reducing the number of blood spots where range is available.

The fact that the production of blood spots is hereditary emphasizes the necessity of excluding from the breeding pen hens that are known to produce bloodspot eggs. If possible to do so, it is a good plan to buy chicks from flocks that are known to be free from this condition.

Inoculating Legume Seed

Condensed from California Cultivator

Justin Scharff

SEED inoculation is an important step in growing a leguminous crop such as peas, beans, alfalfa, clover and vetch. Proper inoculation of these crops may add hundreds of pounds of nitrogen to the soil; without it the soil eventually may be completely depleted of its source of nitrogen. If this occurs, the possibility of ever harvesting a bumper crop is reduced to a minimum. The importance, therefore, of inoculating these leguminous crops cannot be over-emphasized. To the commercial grower it is a matter of dollars and cents.

Seed inoculation is a comparatively simple process. The material used looks very much like ordinary black humus, yet this substance is packed with millions of living organisms, known as soil bacteria. The procedure consists of covering the seed with these bacteria. It is necessary only to put the seed in a container and cover it with water. The inoculant is then added and stirred thoroughly so that all the seeds receive a coating of this bacteria. Then the seed is planted in the usual way.

The legume bacteria cling to the seed until the roots start to grow. They then enter the tiny root hairs where they multiply in great abundance and cause the formation of nodules. These nodules may be seen by examining the roots of any leguminous plant that has been properly inoculated. In many instances the nodules form even without inoculation but that's because the soil bacteria are already present in the ground. However, one cannot depend on that happening so it is wise to inoculate all legume seed before it is planted as an economical insurance measure.

After the nodules form, the bacteria "fix" the free nitrogen circulating in the air surrounding the roots and make it available to the plant. In this regard a distinction must be made between the nitrogen in the air near the roots and the nitrogen in the soil. Obviously, if the nitrogen is taken from the air there is less chance of the soil nitrogen being depleted. That's why when cover crops such as vetches or peas, are inoculated and then turned under they add tremendous quantities of nitrogen to the soil. That is the main reason for seed inoculation.

Reprinted by permission from California Cultivator, Los Angeles, Cal., Oct. 3, 1942

It has also been found that nodules increase the nitrogen in the plant tissues, thereby producing a more healthful growth.

Agricultural experiment stations have found that the yield of alfalfa hay may be increased by more than 1000 pounds per acre by inoculation; in certain instances the yield of alfalfa was increased by almost 1800 pounds per acre. Winter peas were found to contain 3.40 per cent of nitrogen when inoculated and only 0.94 without this treatment. The feeding value of crops such as alfalfa, for example, is also greatly improved by this procedure. On a given plot the amount of protein produced by uninoculated seed showed 321 pounds while the inoculated seed resulted in 392 pounds of protein for the same size area. It should be remembered that the protein value of a crop is often used as the measuring stick for quality.

The cost of seed inoculation is just a few cents per acre, yet it may add hundreds of dollars to the ultimate profit of a leguminous crop. Too, as a soil builder, its value attains high proportions. There are different types of inoculators available, the variety depending on the crop. Alfalfa and sweet clovers, for example, fall in one category, while field and garden peas, vetches and lentils fall in another. Then there is another inoculant recommended for soy beans, for lespedezas and for cowpeas and peanuts.

It is important that the right bacteria be used for a specific crop, otherwise no beneficial results will be obtained. The bacteria do not live forever in the commercial packages. Since most of these containers are dated, make certain that only fresh stock is used. Inoculators are usually made fresh every year so no reason exists for using out-dated bacteria. Don't be misled by the small size of the inoculant. Billions of these bacteria can live in a container that will fit in the palm of your hand. It's a matter of valuable merchandise coming in small packages.

Cleaning the Grain Drill

The best way to clean out a grain drill when changing seed or at the end of a season is to use an automobile tire pump, says Frank Kasl of Dorchester, Nebraska.

—*Nebraska Farmer*

Hens Respond to Extra Feed

Condensed from Poultry Tribune

Noel L. Bennion

Oregon State College

IT takes feed to produce food needed in the war effort. With the shortage of feed and food, poultry producers naturally are interested in obtaining maximum production from minimum feed.

Some flockowners may think it is economical to reduce the feed intake in order to conserve it. Experimental results from the U. S.D.A. Poultry Experimental Station, Glendale, Ariz., demonstrate clearly that *such a procedure not only reduces production but increases the amount of feed required to produce a dozen eggs.* When the total ration was reduced 12½ percent, there was a decrease of 32 percent in egg production and a 27 percent increase in the amount of feed required to produce a dozen eggs.

When the ration was reduced 25 percent, there was a decrease of 52 percent in egg production and an increase of 54 percent in the pounds of feed consumed for each dozen eggs laid. *These results indicate that full feed is essential for maximum production with minimum feed.*

Feeding trials at Oregon State College go to show that egg production can be increased about one dozen eggs per bird per year with pullets or old hens by feeding a supplemental feed in the form of a moist mash or pellets in addition to the regular ration. In these trials pullets that received what moist mash or pellets they would clean up in 30 minutes fed daily at noon throughout the first year of production, on the average laid 11 more eggs and consumed approximately 3 lbs. more feed per bird, than comparable pullets in the check pen that did not receive the supplemental feed.

Yearling hens in their second year of production fed a supplemental feed of moist mash or pellets during the entire year laid 12 more eggs per bird and consumed 4 lbs. more feed than comparable hens on the same ration without supplemental feed.

Laying mash was kept before the check pen at all times with scratch grains fed night and morning. The other pens were fed in a similar manner, except that they received what pellets or moist mash they would clean up in 30 minutes fed daily at noon.

Reprinted by permission from the Poultry Tribune, Mt. Morris, Illinois, Sept., 1943

Pellets were used in some pens and moist mash in others. Pellets gave slightly better results than mash moistened with water and involved less work.

Supplemental feeds do require some additional work. One dozen eggs per bird is a substantial increase, however, and is worth going after to obtain maximum production from minimum feed. In some localities producers may not be able to obtain pellets. A regular laying mash moistened with water or skim milk will produce similar results and will stimulate feed consumption and increase production. Skim milk will no doubt produce better results than water in a moist mash.

Some flockowners use a supplemental feed just as an emergency during periods of decreased production. Experimental results indicate, however, that it will increase the annual production when fed continuously during first and second year lay. Yearling hens to be used as breeders should be given a rest period from about October 15 to December 15 to recuperate and finish the molt. Supplemental feed, however, is a means of stimulating production with old hens used as breeders if early hatching eggs are desired.

Green feed has long been recognized as a valuable part of poultry rations and is one of the most practical ways to conserve feed. The amount of feed required to produce a dozen eggs can be reduced from 10 to 20 percent if an adequate supply of green feed is available. Alfalfa is the most universal source of green feed. Most poultry mashes contain from 5 to 10 percent alfalfa meal. In addition to the alfalfa in the mash 5 or 6 lbs. of succulent green feed or root crops, such as carrots or mangels, fed daily for each 100 laying hens is a valuable supplement to the ration. Young succulent green feeds are very palatable and are a good source of proteins, minerals and especially vitamins.

On the Pacific Coast, Ladino clover, kale and alfalfa are the main sources of green feed for laying hens kept in confinement. Many poultrymen maintain an irrigated Ladino clover patch and cut and carry it to the flock. Ladino will stand continuous cutting and will provide large quantities of forage from about the first of April until November. Kale is used extensively and will provide green feed from October until March.

Mangel beets and carrots while not strictly green feeds, do supply succulence, and carrots especially are high in vitamin A.

Supplemental feeds in the form of pellets, moist mash and green feeds will help to increase production and conserve feed.

Breaking the Biennial-Bearing Habit of Apple Trees

Condensed from Better Farms

Vergil Banner

MANY of the world's greatest discoveries have been by-products. Cornell University research men, aiming at something entirely different, have just hit upon the long-sought means of breaking up the biennial-bearing habits of certain apple varieties.

This new milestone in horticulture, which will mean millions of dollars to commercial orchardists in increased production, is in reality a by-product of a by-product. Nor is the first by-product an inconsiderate discovery. A new method of thinning fruit by spray, it, too, promises to return added millions to fruitgrowers' pockets in labor saving.

But, to begin at the beginning:

Three years ago, while conducting experiments to find a new spray that would control fireblight bugs on Rhode Island Greening trees and which at the same time would not harm fruit-setting, L. H. MacDaniels, formerly of Cornell's Pomology Department, discovered that a dilute solution of a soluble salt of dinitro-cresol, applied at blossom time, would prevent the setting of fruit.

He turned over this idea for what it might be worth to Dr. Melvin B. Hoffman, now acting director of the Pomology Department, who was doing research to find a spray that would thin fruit and thus eliminate the painstaking and costly job of thinning by hand.

For the last two seasons, Dr. Hoffman has been conducting experiments in orchards throughout the state to perfect the new discovery and adapt it to the various different varieties of self-fruitful or biennial-bearing trees, for he learned early in his tests that the new spray not only thins the fruit, but, what is more important, breaks up the "on" and "off" year production routine.

The success of his research work has been so amazing that he has now released a fruit farm service letter detailing the new method so as to make it available to all fruit growers.

In Orange County, where Dr.

Reprinted by permission from Better Farms, Aug. 16, 1943

Hoffman first tried out the new spray in 1941, Wealthy apple trees bore 14 bushels of 120 apples to the bushel, as compared to 13 bushels of 200 apples each per tree in the hand-thinned test rows. On the same trees last year, those that had been sprayed for thinning in 1941 bore 18 bushels per tree, while those that had been hand-thinned were barren as usual during an "off" year.

The new method was tried out on a fairly large scale in Niagara County last year, and this season is demonstrating all that was expected of it—and more.

Albert J. Burrows, Burt, N. Y., fruit grower, had a block of Yellow Transparent trees which were having their "on" season in 1942. He paid six men a total of $26.75 to hand-thin a row of ten trees when they were in full bloom. At 40 cents an hour, this breaks down to 6.6 hours required per man to thin one tree. This cost was so prohibitive that Burrows, who had just heard of the new spray-thinning method, vowed he'd try it "even if it burns up the trees."

"The day after I put it on, I thought I had burned up the trees, as not only were the blossoms killed, but the leaves also took on a seared appearance," Burrows said:

In contrast to the $26.75 he paid six men to hand-pick the lateral blossoms off of ten trees (each twig spur bears an average of six blossoms—one center flower which opens first and five laterals which bloom one to three days later), it cost Burrows $1.50 in materials and an hour of his time to spray the next row of thirteen trees.

The purpose of thinning apple trees during blossom time is to eliminate later competition in the growing fruit and enable each spur to produce one big apple instead of four marble-sized apples. When done effectively, it cuts down materially the number of apples but at the same time increases the yield by producing fewer but larger apples.

Theoretically, the new spray toxicant, applied the moment the last of the lateral blossoms opens and the tree is in full bloom, kills off the newly-opened laterals, which formerly had to be picked off by hand (a slow and tedious job), but does not damage the fruiting of the center blossoms, which, having opened one to three days earlier, already have "set" their fruit.

Despite his apprehension that he had "burned up" his trees by applying the new spray, Burrows was in for several pleasant surprises.

In the first place, it soon developed that the thirteen trees he had sprayed in an hour's time, using $1.50 worth of materials, were much more effectively

thinned than the other row of ten trees which he had paid $26.75 for six men to hand-thin.

Secondly, he noticed that the leaves on the sprayed trees soon recovered from their scorched appearance and by mid-summer had started a vigorous new growth at the time when the leaves on the unsprayed, hand-thinned trees had begun to wane under their burden of fruit production.

It is this effect of the new spray that is believed accountable for upsetting the biennial apple-cart of the trees, as by vigorous leaf-growth late in the season the trees store up sufficient strength to come into full bloom the following season. Under the former biennial scheme, the trees in their "off" years were barren of fruit but developed luxuriant foliage.

The third surprise in store for Burrows was that last fall's fruit from his sprayed trees not only yielded more abundantly than that from the hand-thinned trees but matured a full week ahead of schedule.

"I was first on the market with Yellow Transparents," he said, "and as a result I got a premium price of $2.25 a bushel. A week later, when my other Transparents came on from the hand-thinned trees, everybody was on the market with them and the price had dropped to $1.35 a bushel."

The fourth and biggest surprise of all came to Burrows this spring when the Yellow Transparent trees he had sprayed last year came into full bloom, while the trees he had hand-thinned in 1942 conformed to their biennial custom for an "off" year and remained barren of blossoms.

Burrows now is looking forward to the climax surprise of being able this fall to harvest a crop of Yellow Transparent apples for the first time during an "off" year. Needless to say, he spray-thinned the row of thirteen trees in bloom this year so that next year and henceforth his entire block of Yellow Transparents will be annual instead of biennial-bearing.

The new method, according to its originator, Dr. Hoffman, should be used only on the self-fruitful apple tree varieties which are not dependent on cross-pollination and which consequently bear a bumper crop one year and then rest up the next year.

Although some of the self-unfruitful, or annual-bearing apple trees that are pollinated by bees, need thinning, the spray method is not recommended, due to the guess work that would be involved in determining just when the center flower on a spur had been cross-pollinated by the bees and the fruit consequently "set."

Dr. Hoffman, however, is experimenting in Niagara County now to see if the spray will be

effective in thinning peach trees, where, as in the case of annual-bearing apple trees, there is no problem of "on" and "off" years involved.

In New York State, the self-fruitful or biennial-bearing apple trees include, besides Yellow Transparents, Dutchess, Wealthy, Rome Beauty and the Baldwin.

Contrasted to these varieties, are the self-unfruitful apples, including principally the Delicious, McIntosh and Cortlands, which are cross-pollinated by the hit or miss methods of bees and other insects. While these bear annually, the size of their crops is determined by the type of weather during blossoming, affecting the flight of bees, and the availability of bees in the vicinity of the orchards.

The Horse in Proverb and Phrase

Condensed from The Horse

Harry F. Wild

TODAY'S proverbs and oft-quoted phrases are yesterday's colloquialisms. Time and tradition have mellowed those phrases and proverbs, coloring our speech, and serving as a link between the present and the past, for when we analyze the maxims we use every day we learn how our ancestors lived and thought and what they prized and cherished the most. And it is here that we learn the important role the horse played in the life and times of past generations, for the horse, more than any other animal, figures prominently in the proverbs and phrases handed down to us by our forebears.

How many of the familiar expressions can you call to mind? Of course, you know the most familiar ones—locking the stable door after the horse is stolen; hitching the cart before the horse; lead a horse to water but you cannot make him drink, etc. Everyone knows these familiar phrases and uses or hears them used frequently, and because of their widespread use they receive nothing but passing mention here for it is the purpose of the author to present the lesser known proverbs in which the horse figures and to point out to what degree the horse, even today, is coloring our speech with oft-repeated colloquialisms.

Set a beggar on horseback and he'll ride to the devil.

The biggest horses are not always the best travelers.

Reprinted by permission from The Horse, Washington, D. C.

The master's eye makes the horse fat.

A horse is neither better nor worse for his trappings.

The best horse needs breaking and the aptest child needs teaching.

A nod is as good as a wink to a blind horse. Said of one determined not to take a hint.

It's a good horse that never stumbles. The horseman's way of saying we all err at times.

They cannot draw horses together. Said of those who continually fail to agree.

One man may steal a horse while another may not look over the hedge. This old proverb by Heywood in 1546 is the forerunner of the one we moderns use today, that some people can get by with murder while others are being hung for stealing a loaf of bread.

For want of a nail a shoe is lost, for want of a shoe the horse is lost, for want of a horse the rider is lost.

Flogging the dead horse. Trying to revive interest in a subject out of date. In 1867 Bright said that Earl Russell's Reform Bill was a dead horse and that trying to revive it was like "flogging the dead horse."

You have found a mare's nest and laugh at the eggs. The horseman's proverb of incongruity.

A shoemaker's wife and a smith's mare are always the worst shod.

He rides the wooden horse. Said of those being punished. The wooden horse was similar to a saddle to which military men were bound and flogged for breach of discipline.

I will win the horse or lose the saddle. Sometimes known as the "double or quits" proverb, the origin of this expression is of interest. A man offered a horse to his friend provided the latter could repeat the Lord's Prayer without permitting his mind to wander. The agreement was made and the friend began to speak the words of the Prayer, but when he was almost finished he paused and inquired: "By the way, does that include the saddle also?"

Let us see in what manner the horse is responsible for colloquialisms which are creeping into common everyday usage until they naturally become a part of accepted conversation. Where to look? The race track and the show ring, of course.

Let there be no doubt about it, the race track is coloring the speech of Americans more and more every day. Read any section of your newspaper aside from the racing news and you will still encounter such phrases as "dark horse," "dead heat," "ringer," "home stretch," etc. True, these expressions are probably as old

as racing itself, but today, more than ever, we hear them applied to countless everyday situations.

The most notable contribution of the American racetrack to everyday conversation during recent years is the expression "photo-finish." This expression has crept into our conversation quite easily and naturally and now everyone uses it to describe a close and heated contest.

While there may be those who will disagree with me I am willing to go on record as believing that "take" and "handle" when used to denote profit and total receipts respectively are expressions which were born on the racetrack with the advent of the pari-mutuel system.

Sometimes the origin of a common expression is so odd and farfetched it is definitely of the believe-it-or-not variety. For example, the term "charley horse" is so commonly used in baseball that one naturally believes it originated on the baseball diamond. However, this is not entirely true. John Wray, eminent sports writer, in his daily column in the *St. Louis Post-Dispatch,* reports that the racetrack is responsible for the expression.

According to Wray, who bases his opinion on information in the files of *The Sporting News,* the national baseball publication, the term "charley horse" originated with the great Billy Sunday, when the late renowned evangelist was a member of the famous Chicago White Stockings baseball team in 1886. According to the records, the entire Chicago team was at Washington Park racetrack and, as is to be expected, one of the players came up with a "sure thing bet," a horse named Charley. As a result the entire team bet heavily on Charley, who rewarded them by limping home a very bad last.

The next afternoon, during the ball game, Billy Sunday was coaching at third base when George Gore, one of the White Stockings' fastest runners, leaned on the ball and drove it far over the outfielder's head. Gore raced around first base, steamed past second, and headed for third, certain of at least a triple if not a home run inside the park. But suddenly he pulled up and began to hobble towards third base. He had pulled a tendon or muscle in his leg and had suddenly gone lame. As a result he was tagged out by the opposing third baseman. Complaining bitterly, Gore hobbled dejectedly to the bench. But the look of dejection turned to a smile when Billy Sunday turned to his teammates and yelled: "Look, boys! Here comes old Charley horse!" The expression is still being used after all these years — probably the horse racing world's only contribution to baseball!

The Odyssey of the Turkey

Condensed from Frontiers

Paul Russell Cutright

ON Thanksgiving Day many million turkeys will be consumed by the American people. Considering the magnitude of this annual gastronomical feat, one views with mild surprise the fact that among the millions who gather about the table on a certain Thursday in November, only a few know the origin of our domesticated turkey.

The opinion generally held is that the William Bradfords, John Aldens and other colonists domesticated the turkey from the wild form which they found abundant in the New England forests. The truth is that the bird associated with Thanksgiving since 1621 did not have its origin in any part of what is now the United States, but in southern Mexico, the land of the Montezumas.

When Columbus was placing the Western Hemisphere on the map of the world, one finds that the Genoese navigator discovered not only a large land mass but with it a tremendous assemblage of mammals and birds.

Not the least of the birds was the wild turkey, technically called *Meleagris gallopavo*, which at that time ranged from Maine and the Dakotas to the Gulf and southern Mexico. Although there is but the one species in this territory, it is not surprising to discover, considering the extent of its distribution and the variety of climate involved, that there are five subspecies, or geographical races.

Of these, the Eastern Turkey is found from Pennsylvania to the Gulf of Mexico; the Florida Turkey in the southern part of the state of that name; two others, the Rio Grande Turkey and Merriam's Turkey, in northern Mexico and the southwestern part of the United States; and the Mexican Turkey, found only in southern Mexico. It is this last which arouses our interest for it is the one which gave origin to our Thanksgiving turkey.

Although many tribes of American Indians hunted the wild turkey, the only Indians, so far as we know, who were seriously engaged in its domestication at the time of Columbus and Cortez were the Aztecs of Mexico and the Pueblo tribes of Arizona and New Mexico.

Just who among the Spanish

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navigators was first to become acquainted with the domesticated turkey is not known. It may have been Francisco Fernandez who, in 1517, landed on the coast of Yucatan, for a probability exists that the Mayas had transplanted *Meleagris gallopavo* by this time. We know definitely, though, that another Spanish adventurer, Juan de Grijalva, sailed to the west of Yucatan the following year and became the discoverer of Mexico. He passed four or five months along the eastern coast of that country and encountered the emissaries of the Aztec monarch at several places.

Both Grijalva and the Indian *caciques* were eager for information, the former respecting the prevalence of gold and the latter concerning the invaders' military strength, so that for the time being they met on equal terms and made a show of friendship by exchanging gifts. Among the offerings presented to the Spaniards was the turkey. Grijalva questioned the natives and learned that this bird was common among them, being wild in the forests and domesticated about the home.

Just three years later, Hernando Cortez completed his subjugation of the Aztecs and took possession of Tenochtitlan, the capital of Montezuma's realm. From the records left by the historians of this era we learn that the Aztecs relied greatly upon the turkey for food. According to Prescott, the Aztecs were accustomed to hold great feasts and at such times, "The table was well provided with substantial meat, especially game, among which the most conspicuous was the turkey."

Prescott writes further that, "Torquemada has extracted the particulars of the yearly expenditure of the palace (Montezuma's) from the royal account-book which came into the historian's possession. The following are some of the items, namely: 4,900,000 fanegas of maize (the fanega is equal to about one hundred pounds); 2,744,000 fanegas of cacao; 8,000 turkeys."

We learn, too, that Montezuma had in his possession a remarkable collection of animals among which were not only those of his own country but others brought at great expense from distant places. This menagerie, we are told, would have compared favorably with some of those housed in large zoological gardens today. The problem of feeding the beasts of prey in this collection was a major one, requiring large quantities of meat. This demand was met, however, without appreciable difficulty since turkeys were so abundant that they could be supplied to the beasts in large numbers daily.

From this point, the turkey,

which had been an exclusively American bird, was to start on a journey which ultimately would take it to practically all the countries of the world. According to several chroniclers, the turkey was taken to Spain in 1519 by Fernandez, just two years after his visit to Yucatan.

The introduction of this fowl into European cookery was a popular one. The Spaniards found it as delicious as the conquerors said it would be. More than that, it was to be of lasting value, for turkeys are still raised in Andalusia and other Spanish provinces. It soon passed beyond the confines of the Iberian peninsula. Within a few years it had found its way on to the tables of the Dutch, the French, the Italians and the English.

No account of the turkey's arrival in the British Isles is known to exist. The earliest year mentioned for its immigration is 1524 although this date is disputed by some of the early English writers who state that it was not introduced into their country before 1530. The date, 1524, arises from a bit of doggerel written in reference to that year:

"Turkeys, carps, hoppes, picarel and beer,
Came into England all in one year."

At any rate the turkey was in evidence by 1541, although apparently not plentiful, for in that year Archbishop Cranmer allowed only one dish of turkey cocks to be served at state dinners and no turkey hens.

By 1555 turkeys must have been more numerous, for we read that when certain sergeants-at-law were inaugurated they had for their dinner "two turkeys and four turkey chicks" which cost only four shillings apiece. At the same time, swans and cranes were priced at ten shillings each and capons at half a crown.

By the end of the century turkeys were a common bird throughout England and Scotland and were seen as frequently on the table of the farmer as of the nobleman. This ready adaptation of the turkey to the environment of the British Isles and its quick increase there are surprising, since the climate is at considerable variance with that of Mexico.

It was shortly after the turkey's introduction into England that it received the name which it bears today. Just how this came about is not certain. There are two theories, either of which may be correct. According to one, the name "turkey" is onomatopoetic, suggesting the familiar call notes of the bird which resemble the syllables "turk, turk, turk."

According to the other theory, it received its name from the guinea fowl, a bird of African lineage, which arrived in the

British Isles via the Ottoman Empire, better known as Turkey. This latter fowl consequently was dubbed "turkey" and the American bird, due to specious reasoning on the part of the British, was later given the same name.

Within a century after the Spaniards had brought the turkey to Europe the Pilgrims and Puritans were taking passage for America. These adventurous spirits were earnest in their intent to form homes in the New World. They carried with them those effects which they regarded as most necessary in insuring permanence to their efforts at colonization. We know that they brought with them wheat, oats, barley, peas, beans, cabbage and carrots. We know, too, that they brought the horse, cow, pig, sheep, dog, goose, duck and chicken. And, of particular interest at the moment, they brought the turkey. It was wise that they did so, for they found in their new home not a single domesticated animal to add to the ones they already possessed.

The wild turkey of the east was involved but little in the development of the various kinds of domesticated turkeys seen today, even though all of the subspecies interbreed freely. The domestic fowl that is familiar to all of us still shows its Mexican ancestry in the white-tipped tail and rump feathers characteristic of the Mexican variety. These same tips are a rich chestnut color in the race which is found native to the Allegheny Mountains.

And so by a strange series of events, the common barnyard turkey actually came from the realm of Montezuma in southern Mexico. It crossed the Atlantic to Spain in the caravels of the *conquistadores,* moved by degrees to England in the reign of Henry VIII and sailed the Atlantic once more a century later in the hold of the "Mayflower," to become symbolic of Thanksgiving in the United States.

Cracks Corn for Hogs

Some feeders contend that it does not pay to crack corn for hogs, but Doyle Allison has proved swine gain so much faster on cracked corn that the grinding pays. It takes considerable grain to maintain a hog without gain, so feed is saved when fattening time is shortened.

Allison put out both whole and cracked corn at his farm in Allen county, Indiana, and pigs ate more than twice as much from feeders containing cracked grain.

—*Capper's Farmer*

How to Make Galvanized Roofs Last Longer

Better Farm Equipment and Methods

K. J. T. Ekblaw
Agricultural Engineer

A FEW simple steps are all that need to be taken to put galvanized roofing in such good shape that it will give satisfactory service for the entire life of the building which it covers.

Galvanized roofing which, as every one knows, is steel roofing coated with zinc, is one of the main standbys in the rural roofing field. Several hundred thousand tons, representing millions of squares of roofing, were bought by farmers each year in the years preceding the war. It was popular in every section of the country because of its economy, its convenience and its adaptability. The farmer who wanted a roof that would stand the gaff of wind, weather, storm and time would buy galvanized roofing.

When the war came along the demand for both zinc and steel became so great that practically all of it went into war requirements. Steel was used for building tanks and ships, planes and guns. Zinc found its use in brass, in paint pigments, in die castings and a hundred other places. Such galvanized roofing as was made was reserved for war construction, barracks, huts in Iceland and Africa, and cantonments.

The wartime disappearance of the supply of galvanized roofing from rural markets naturally is rather disappointing to farmers, but they have made up their minds that since they cannot purchase new galvanized roofing they are going to make the most of the roofing they have. Fortunately galvanized roofing is the kind of roofing that with a little care can be made to last; indeed it is not unusual to find it lasting longer than the building to which it is applied. Any farmer can tell of instances in which the galvanized roofing from old or dismantled buildings has been salvaged and placed on new ones. Sometimes three or four buildings in succession have inherited their roofs in this way.

The work of rehabilitating metal roofing might be divided into four phases.

The first essential for any kind of a good roof is that the supports be in good shape and substantial. Therefore, look at the rafters, braces and plates which

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support the roof. They should be straight and in good alignment. Sometimes the building itself may have been warped or twisted out of shape, in which case it should be straightened up and given some additional bracing, using old and odd pieces of lumber which usually can be found lying around on any farm.

The second step is to align the roofing material itself. The galvanized sheets constituting the roofing may be corrugated, v-crimped or of some special style, but these corrugations and v-crimps were put in straight and true originally and if the sheets are laid and lapped as truly, the whole roof itself will be straight and true.

Sometimes sheets have to be loosened and re-aligned in order to get a good job done. Most buildings are built with the rafters two feet apart, center to center, and this exactly fits the width of the roofing sheets; the latter are made of such a width that when they are properly laid and lapped the net width of coverage will be two feet.

Careful laying and careful aligning, with proper attention to side and end laps, will cure most cases of leakage through the laps. In occasional stubborn cases it may be necessary to draw the sheets together by some positive means. A simple and convenient expedient is to punch a small hole through the sheets with a sharp tool, then insert a sheet metal screw, and draw the sheets up tight with a screwdriver. Sheet metal screws are short, hardened steel screws with the sharp threads running close up under the head.

The third step in roofing repair is renailing. Unfortunately many metal roofs have been laid with ordinary nails, and when such nails are used they often rust through completely or work loose so the roofing itself is loose and leaky. The best roofing nails are made with lead under the head; thus when the nail is driven the lead will be forced down around the shank of the nail into the hole and moisture is completely sealed out. These nails also have screw type shanks instead of straight shanks, and when they are driven they turn like a screw, hold like a screw and never work out. To renail a roof is not too much of a job; the old nails can be pulled out and the new ones driven through the same holes. They should be long enough to get a good grip; for a renailing job 2½-inch or 2¾-inch nails are recommended. It is also recommended that they be driven in at a slight angle from a vertical so as to give them a better grip.

The fourth and final step in the preservation of metal roofing is to paint the roofs so as to give them further protection against rust.

The sheets were originally completely coated with zinc and so long as the zinc lasts there will be no rusting. However, zinc itself gradually disappears in the atmosphere, and on most roofs the time comes when rust spots will appear. The advent of rust is usually indicated by a darkening of the surface of the sheets, which means that the outside zinc coating is about gone and the intermediate "alloy" coating is all that is left; as soon as the alloy layer breaks down the steel is exposed and rusting will begin.

The proper time to paint galvanized sheets is at the appearance of the characteristic alloy layer. Painting really is not necessary before this time, but many people keep their galvanized roofs painted all the time just as insurance against rusting.

The selection of a satisfactory paint used to be quite a problem. Dozens of so-called roofing paints have been tried and found wanting. In recent years the swing has been to metallic zinc paint; and indeed, all tests indicate that this particular paint is far superior to others. Its formulation, according to Federal Specifications TTP-641, includes 80 per cent of zinc dust, 20 per cent of zinc oxide, with a vehicle consisting either of linseed oil, soya bean oil or some quick - drying synthetic resin. Paint of this character adheres perfectly to galvanized sheets, and its durability is really remarkable.

Practical field tests indicate that under average rural conditions two coats of this paint are the practical equivalent of a commercial coat of galvanizing, and will give protection against rust for a period of twelve to fifteen years. The paint is usually gray in color, matching the natural color of galvanized sheets almost perfectly. However, some companies make it up in green, red and other colors.

It is sometimes practicable to "spot paint" the roof, in which case only the rust spot themselves are given a first coating and then the whole sheet is given another coat. Some economy is effected through such a practice. Of course, if the roofing is badly rusted it should be brushed off with a wire brush, washed down with water to remove all loose material, and then thoroughly dried before the two coats of metallic zinc paint are applied.

None of the above steps for the conservation of metal roofing are complicated or difficult, nor are they expensive. If they are carefully followed the roofing now on farm buildings can be made to give excellent service for the duration of the war and for an almost indefinite time following.

Why Does the Butterfat Vary?

Condensed from The Larro Feeder

THE subject of butterfat percentage is constantly before the dairyman because practically all settlements for market milk are based on a certain butterfat standard, with a premium or discount if the butterfat is higher or lower. Also the producer of milk for retail distribution finds it very necessary to maintain a good cream line in the bottled milk.

It is well known by investigators that the butterfat percentage of any individual cow varies from milking to milking and from day to day, as well as over the period of lactation. Many causes have been assigned to these variations, but not all of them have been substantiated.

The variations in the test between the evening and morning milk are to a great extent caused by the difference in the elapsed time. Usually the morning milk is not as rich as the afternoon milk. However, if the cows are milked exactly at 12-hour intervals, then there is generally very little difference, though occasionally cows will give a richer milk in the morning than at night.

In a bulletin put out by the British Government the following conclusions are reached:

"1. When the intervals between milking are about 12 and 12 hours, for example, cows milked at 6 A.M. and 6 P.M., then the morning fat exceeds the evening fat by .18% on an average of 22 tests.

"2. When the intervals between milking are about 13 and 11 hours, for example, cows milked at 6 A.M., and 5 P.M., then the evening fat exceeds the morning fat by .33% on an average of 192 tests.

"3. When the intervals between milking are about 14 and 10 hours, for example, cows milked at 6 A.M. and 4 P.M., then the evening fat exceeds the morning fat by .7% on an average of 18 tests.

"4. When the intervals between milking are about 14½ and 9½ hours, for example, cows milked at 6 A.M. and 3.30 P.M., then the evening fat exceeds the morning fat by 1.09% on an average of 391 tests."

The above information should be borne in mind by bottlers of milk, for if there is a considerable difference in the intervals between milking, then the evening milk, if bottled separately, is likely to be of higher butterfat content than the morning milk.

Reprinted by permission from The Larro Feeder, 8047 Hamilton Ave., Detroit, Mich.

The individuality of the cow is the strongest influence on butterfat percentage, and a cow that is definitely a higher tester than another cow, will consistently be a higher tester throughout her lifetime. It seems practically impossible to change the effect of the breeding behind the cow.

Many people are of the opinion that the fat percentage can be increased by changes in the character of the feed, but despite the claims made, this still remains to be demonstrated. One reason for the positive views that are occasionally expressed on the subject is the fact that no consideration was given to the influence of seasons of the year or the length of the lactation period.

Tests conducted at the Larro Research Farm, which are abundantly confirmed by trials made on other farms, show that the first month's milk of Holstein cows is much higher in butterfat than the second and third months. The third month is usually the lowest in test, and thereafter the test gradually rises.

There is also a seasonal influence in that the test for May, June, July and August is substantially lower than the test for the other eight months. Our average figures show a slight variation between the different months of autumn, winter and spring, but these variations are so slight as to be negligible.

Unless the investigator keeps in mind the influence of season and the length of lactation on the percentage of butterfat, it is very difficult to draw fair conclusions from trials that are made to determine the effect of feed. A cow freshening in July will gradually increase in butterfat content after the third month, whereas a cow freshening in January will gradually increase in butterfat content after the sixth month.

Butterfat tests are usually made only once or twice a month, with the possibility that this individual test may not be thoroughly representative of the month's average.

A factor that seriously affects the butterfat content is the thoroughness of milking. Tests have been made of the butterfat content of various portions of the milk produced, showing that the first milking may have a butterfat percentage as low as 1% when the last milking would run up as high as 6%. In a cow that had a total butterfat percentage of 4.30%, the first pint of milk drawn had a percentage of 2.17% and the strippings had a percentage of 6.56%, and it was shown that when unskilled or careless milkers are employed the butterfat percentage can easily be .5% less than if the cows were milked by experienced and thorough milkers. Unfortunately, there are indications that butterfat left in

the udder by failure to properly strip does not carry over and enrich the following milking.

If a cow is suddenly affected by ill health, especially to the extent of greatly diminishing the milk production, then the butterfat percentage is likely to run abnormally high, though the total of butterfat produced will, of course, be lower. Usually such a condition prevails only for a short period of time and need not be considered, excepting if a sample is drawn at that particular time and the figure used without considering the amount of milk production, then the facts are distorted.

Winter Care and Feeding of Ewe Flocks

Condensed from Sheep Breeder

Bill Connel

Pennsylvania State College

PROPER care and feeding of the ewe flock during the winter period is essential if satisfactory returns are to be expected. One of the most important reasons why sheep have disappeared from certain sections of the farm states is due to careless management and lack of sufficient feeds of the right kind.

A large percentage of the losses in the industry today could be eliminated by a more intelligent system of feeding and management. A careful job of culling during the late summer when all broken mouthed, light shearing, unthrifty ewes are removed, is the first step toward satisfactory returns for the ensuing year. These ewes should be replaced by a few well-grown, healthy ewe lambs.

The amount and kind of feed given the flock during the winter will depend on a number of different factors, such as location, feed available, size of breeding ewes, time of lambing, and the condition of the flock when winter time arrives.

The breeding flock should carry considerable flesh when they come into winter quarters. This is considered important by the intelligent flock-owner. The flock should have protection from bad weather, and be housed in dry, well-ventilated quarters.

Legume roughage, such as al-

Reprinted by permission from the Sheep Breeder, Chicago, Ill., Feb., 1943

falfa, clover, and soybean hay, are important in the breeding ewe's ration. The farmer who has plenty of alfalfa hay and good, clean corn silage finds it necessary to feed very little grain until lambing time approaches. One of the most profitable flocks of 75 ewes that came to the writer's attention last spring was wintered on second-cutting alfalfa hay and corn silage. The ewes had free choice of the alfalfa hay and the corn silage was fed at the rate of two pounds per head per day. No grain was given these ewes until two weeks before lambing.

Corn silage and roots, such as turnips, rutabagas, and mangels, furnish a splendid succulent feed which is important at this time of year. Spoiled or frozen silage should be avoided. Two or three pounds of silage is sufficient until after the lambs are dropped.

Timothy hay when cut in early bloom and supplemented with a protein feed like bran, linseed meal, or soy bean oil meal has given satisfactory results. Timothy cut late is a very poor roughage. Any kind of roughage should be supplemented with good grain mixture, such as oats and bran, from three to six weeks before lambing time. If the breeding ewes are lacking in flesh, a little corn or barley can be profitably added to this grain mixture.

The necessity of liberal feeding at this time of year can be readily understood when we realize that the breeding ewe is developing an unborn lamb, maintaining her own body weight, as well as producing a fleece of wool. The amount of grain fed depends upon the size of the ewe. Plenty of exercise is highly essential to the breeding ewe. Some of our more careful farmers scatter the roughage on the ground some distance from the sheep barn so the flock will be obliged to take the proper amount of exercise each day.

Salt and fresh water should be available to the flock at all times. The average bred ewe will drink a gallon of water each day if it is available. The fact that a sheep is somewhat of a scavenger has been overemphasized in the past. Sheep are similar to any other class of livestock, and will respond in direct proportion to the care they receive. The sheep man must be the type of man who likes the sheep business and takes pride in his achievement as a shepherd. He must pay close attention to every detail of management. The man who finds profit in the business is the fellow who notices the ewe that fails to come to the feed rack, or a ewe that does not have milk for a new-born lamb. These are only two examples of a number of small details that are necessary to profitable sheep husbandry.

How Much Gas?

Condensed from New Jersey Agriculture

Roger DeBaun

TRYING to estimate the gasoline needs of a tractor for a given job is a chore that can waste a great deal of a farmer's time. What the ideal tractor in perfect condition should accomplish under full load and perfect driving is not what the farmer's tractor actually will do.

Most farmers are a long way from a repair or part shop and they cannot afford to have a service man at hand to keep tractor and tools tuned up to perfection. It is all right to issue advice that tractors must be run at full capacity, no more no less, so as to use gasoline and oil efficiently, but anybody who thinks that this can be done more than about 10 per cent of the time knows little about farming.

On the farm, when a job is to be done it has to be done when it can be done, either because time and help or both happen to be available and won't be available at some other time or because seasonal, climatic, or economic pressure forces action. If the truck gets stuck in the lane to barn No. 3 with a half-ton load, for example, the farmer is not going to let it sit there for a few days until he can think up a load to take along with his tractor. He will go out with his tractor and yank the truck out. That is a trip "empty" both ways, and perhaps the truck yanking itself was not a quarter load for the tractor.

On the other hand, if a great truckload of lime or fertilizer bogs down on its way from freight yard to barn No. 3, the farmer is not going to unload just to be sure he won't overtax his tractor beyond its rated efficiency. With the lane blocked by the truck, where would he put the unloaded stuff anyway? The farmer will go out there and chain the tractor fast to the truck. Then the tractor has to settle right down into its collar and pull. The farmer doesn't care, and he'd be a fool if he did, whether the tractor is burning 20 per cent more gasoline than it would under an ideal load. The big things are to get that 10 tons of stuff into the barn, the truck on its way, and the lane cleared.

Even when engaged in the single operation of plowing, the load would vary tremendously

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with different types of soil frequently found on a single farm. And if the soil is stony, the danger of breakage may compel running at slower speeds and therefore, perhaps, at a lower gear than highest gasoline efficiency might dictate.

These may seem like tiresome details to some folks, but they suggest some of the realities of farming. Farming is virtually a series of emergencies. Many of them the farmer knows will happen, but just when is always a question. He knows that haying will have to be started—when the grass is ready—if the weather is then right—if he can get help.

And so to get back to the gasoline consumption of tractors. How much they will use for a job depends not only on the general factors I have mentioned but also on the kind of tractor and the quality of the gasoline.

As a general guide to persons who have to arrive at some approximate figure for ration purposes, I present some information gathered by Prof. E. R. Gross, agricultural engineer, for county agent Orley G. Bowen. The figures are averaged from the work of various testers with different kinds of tractors on different kinds of soil. Notice the enormous difference in gasoline consumption between the lower and the higher figures for some operations.

Operation	Gals. Gasoline Per Acre
Plowing	2.5 to 4.0
Row crop cultivating	.75 to 1.25
Discing	1.0 to 2.0
Harrowing	.75 to 1.25
Grain binder	.75 to 1.25
Combining	2.5 to 3.5
Grain drill	1.5 to 2.0
Corn planter	1.25 to 2.0
Potato planter	2.0 to 3.0
Hay loader	1.5 to 2.0

As I have tried to make clear, farmers cannot operate under ideal conditions. They have to take things, conditions, and help as they can get them. They have to get the job done. Under these circumstances the farmer's tractor will generally burn up far more gasoline than some theorist thinks it should. In figuring requirements, therefore, the higher amounts shown in the table are the safer, unless actual operation tests of a particular tractor in question show otherwise.

A New System of Culture in Agriculture

Condensed from The Farmer's Advocate

IT was December 19—there was no frost in the ground. A stiff breeze was blowing from the north threatening rain or snow, but Howard Fraleigh, of Forest, Ontario, had two tractors on cultivator and disc preparing the seedbed for spring. A team on the harrows followed, and another team was yoked to the plough running water furrows to take off surface water. Mr. Fraleigh frequently cast his eye on the clouds during the afternoon, and as frequently remarked: "If the weather holds for another day my land for spring cropping will all have been worked and most of it ready for the drill."

"But won't this soil run together with winter and spring rains and necessitate more work in the spring?" asked an editor of "The Farmer's Advocate" who had journeyed to Forest to learn what was peculiar about the Fraleigh acres that made fall work and early seeding feasible and advisable. We had been taught that a rough surface in the fall was preferable to a fine mulch. In fact, experience on Weldwood Farm had proved that the finer the surface in the fall the greater the tendency for the soil to run together, necessitating extra work in the spring in order to make a desirable seedbed. On returning home from Mr. Fraleigh's we looked over our own acres with the thought of putting the cultivator to work, on one field, but decided that the soil was too sticky to work.

There is a marked difference in soils and a capable farm manager studies his land and ploughs and cultivates and seeds according as experience has taught him. There was a lot of late cultivating last fall or early winter. Many fields were seen between London and Forest where the cultivator had been at work. In some instances it was a stiff-toothed cultivator that had been used to dislodge twitch grass that was beginning to green with the mild weather; others had worked fields that had been ploughed early rather than ploughing again.

But Howard Fraleigh was busy on December 19 preparing the land for spring seeding. It was dry and worked down to a fine mulch. This practice was followed a year ago, and Mr. Fraleigh had his oats all sown long before

Reprinted by permission from The Farmer's Advocate, London, Ontario, Canada

his neighbours got started. The soil dried on top and as soon as the frost was out a couple of inches, the drill was started. "You could see the frost at the bottom of the drill marks," said Mr. Fraleigh, "but the yield was extra good and the catch of clover was splendid. If I wait until the frost is all out it may be three weeks or more before I can get on the land and then the yields are not so good as with early seeding," claimed Mr. Fraleigh. For this reason the land was prepared last fall so that no time would be lost in the spring. Last spring Mr. Fraleigh went right on with the drill without further work, and the seed went into as fine a bed as ordinarily could be made by several cultivations and harrowings in the spring. He expects the soil will be in a similar condition some time next spring just as the frost commences to come out.

Over 200 acres are prepared for spring seeding. "Even if conditions are not so favourable next spring for seeding and I have to work the soil, it will only require once over in place of two or three times if I didn't work the land down in the fall," said Mr. Fraleigh. "The labour problem will be much more acute next spring than it is now, and this work I am doing will save time, and early planting is the best," claimed Mr. Fraleigh, who not only has cultivated and harrowed but has double disked and packed some fields. Mr. Fraleigh has 15 parcels of land comprising some 1,200 acres originally acquired for growing flax. Part of it is low land broken out of elm swamps and part is high land that formerly grew beech and maple.

There were thousands of acres of similar land in Lambton County, that on December 19 was powdery dry on top, but Mr. Fraleigh had only converted two of his neighbours to his procedure. T. W. Govenlock had a tractor on a double disk and a team on a cultivator on the day in question, and remarked that he should have been working the land earlier in the week.

Last December the weather was unusual. It allowed farmers to plough and more land than usual was blackened. Some took advantage of the dryness of the land to tear up grassy fields that had been ploughed early. But Mr. Fraleigh and his two recruits were the only men we met who were working ahead of schedule in order to save labour and time in the seeding operations next spring. If this works out for these men, there are hundreds of farmers on similar types of soil who lost an opportunity of getting their seedbed made last fall in readiness for the drill the first day in the spring when there is

a couple of inches of dry soil on the surface. On the other hand there are types of soil in which the frost must be all out before the surface commences to dry so that seeding may commence.

Mr. Fraleigh does not always follow orthodox methods in some of his other farming operations. His system of wintering Aberdeen-Angus cows around hay and straw stacks, having them calve in early spring and finishing the calves for market at 12 to 14 months has won several recruits. He and some of his neighbours are now building the hay and straw stacks at the back of the farm or in fields where manure is needed rather than near the water supply. It is easier to draw water than to draw manure to the back of the farm they claim. The cattle are held within bounds by an electric fence. The stacks are fenced with poles to prevent cattle tearing them down. They reach through the poles and eat around the bottom of the stack, then the feed is thrown down on the inside of the poles. The cattle get their feed without tramping it. On several farms Mr. Fraleigh uses his flax barns to store hay and corn fodder. The sides are open and poles keep the cattle on the outside, but the hay and corn stalks are rolled against the poles so the cattle can feed. An end of these barns may be open so the cattle can get some shelter, but we understand that they usually lie outside even when the weather is rather rough.

Mr. Fraleigh has also proved that wornout pastures can be brought back to heavy production. Some of this land long in pasture is practically devoid of phosphates. The practice followed is to break 12 or 15 acres in the spring, pack it, work well and drill in one bushel of oats and 25 pounds of grass seed, mostly orchard grass and timothy with some clover. Sweet clover has also proved advantageous in renewing the soil. Around 100 pounds of an 11-48-0 fertilizer have been used per acre, and results are quite satisfactory. Electric wire is used to fence off the seeded acres while the cattle get what grass there is on the remainder of the farm. They later feed on the green oats, and the grasses and clovers come on for the next year. Howard Fraleigh is not afraid to try new methods, and in most instances his hunches become the general practice on his own and on some of his neighbours' farms.

Cover Crops Prevent Erosion

Condensed from Fertilizer Review

R. H. Lush

THE successful growing of any crop depends largely upon the fertility of the soil and good farming methods. Any plan for maintaining or increasing the fertility of the soil while producing crops efficiently must include liming, if the soil is too acid, conservation of farm manure, use of fertilizer, and under many conditions the growing and plowing under of cover crops.

All cover crops aid in maintaining soil fertility by keeping the land covered, thus preventing erosion. When plowed under these crops add organic matter, and the legumes gather atmospheric nitrogen. The non-legumes take up soluble nitrogen and other plantfood, retaining it for the use of crops that follow. The roots of all crops add organic matter that is thoroughly distributed through the soil.

H. E. Hendricks, Tennessee extension agronomist, has recently estimated that over 32,000 tons of available nitrogen are leached from Tennessee soils every fall and winter, due to a lack of cover crops on one-half of the crop acres of the State.

Experiments show that winter crops reduce moisture loss by 10 percent and soil loss by 13 tons per acre. Much of this loss occurs during October and November when cropland is normally bare and subject to heavy fall rains. Fall-seeded small grains will utilize nitrogen which would otherwise be lost, prevent erosion, furnish winter pasture for livestock, and still produce grain or hay. Legumes or legume-grass mixtures add nitrogen to the soil and conserve that which is already there.

The growing of annual winter legumes is an old story in the South. But only one acre in thirteen had the benefit of a winter legume.

The lack of an adapted legume which will produce seed at low cost has retarded the development of the winter legume program in many sections. A satisfactory cover crop should be inexpensive to plant, disease resistant, and winter hardy. It should make a large top growth in time for turning under well in advance of the succeeding crop.

In the South locally adapted strains of clovers, vetches, peas, and lupines; bur clover in the

Reprinted by permission from the Fertilizer Review, July-Aug.-Sept., 1943

Mississippi Delta; crimson clover in the Middle South; crotolaria and Sesbania in Florida, have been the partial answer to that problem, together with the annual legumes which are grown in some sections. Winter grains, rye-grass, and perennial legumes like lespedeza sericea, and kudzu appear to be the answer on eroding lands. Even weeds, corn and cotton stalks, and other crop residues are useful as covers. Cowpeas, soybeans, velvetbeans, and lespedeza are valuable summer legume cover crops in the South.

In the North, red, alsike, mammoth, Ladino, and sweet clovers; soybeans, field peas, and alfalfa; various cereals, ryegrass, timothy, and other grasses, are used successfully as cover crops. The perennials have an advantage in that they keep the land covered during the winter and make a large top growth during the summer.

The successful growing of cover crops on most land requires the use of commercial fertilizer. Winter legumes, following well-fertilized crops, are usually quite successful. Corn land, which is usually poorly fertilized, and land which received no fertilizer the previous season, will respond profitably to liberal applications of superphosphate, phosphate-potash or complete fertilizers. In an experiment at Petersburg, Virginia, 19 bushels of corn per acre were produced with no cover crop; unfertilized crimson clover increased the yield to 36.6 bushels, while crimson clover fertilized with 300 pounds of 0-14-7 increased the yield to 58.6 bushels of corn per acre, an increase of 22 bushels due to fertilization of the cover crop.

A recommendation made in Mississippi and applicable to most of the South is that one-half of the money available for winter-legume planting should be used for fertilizer and the other half for seed. Out of 158 demonstrations in which 36 to 48 pounds of phosphoric acid per acre were used on winter legumes in Louisiana, 53 percent showed increases in growth of 100 percent or more and only 2 were unfavorable.

The value of winter-legume cover crops is shown by many experiments, only a few can be mentioned here. For example, at the Georgia Coastal Plain Experiment Station, over a 14-year period, corn yields were increased 20.1 bushels and seed cotton yields 620 pounds per acre by the use of wintering legumes.

At the Cotton Branch Station, Marianna, Arkansas, the average yield of seed cotton has been increased by 200 to 250 pounds per acre, and the corn yield by 9 to 11 bushels per acre by the use of legumes; and at the Rice Branch

Station, Stuttgart, Arkansas, the average increased rice yields following different legumes has ranged from 7.8 bushels for bur clover to 11.3 bushels for vetch over an 11-year period. In 16 demonstrations in North Carolina in 1941, Austrian winter peas increased the average corn yield from 30 bushels to 46 bushels per acre, and lint cotton was increased 146 pounds per acre in similar tests.

With long rotations where seedings are mixtures of grains and legumes that are to be used later as hay and pasture there should be a liberal application of fertilizer at time of seeding. A number of experiment stations have recently increased their recommendations for new seedings because it is an accepted fact that legumes must be fed if they are to fix nitrogen for later use by other crops. A large initial application is more effective than the same total amount applied in annual applications. The crop gets a better start with the heavy application and it is possible to work materials into the soil deeply, as compared to annual topdressings.

A six-year test at the Mississippi Delta Station showed that while a winter legume every year gave an increase in seed cotton of 421 pounds per acre, a winter legume every second year gave only 271 pounds per acre, but when the winter legume was alternated with 30 pounds of commercial nitrogen the increased yield was 427 pounds per acre. A winter legume every third year gave an increase of only 127 pounds per acre, indicating that for most economical yields either a winter legume or 30 pounds of commercial nitrogen should be used each year.

In addition to being fertilized, the total growth should be plowed under for maximum effect, unless more valuable as a feed crop. Seven years' results with eight legumes at Marianna, Arkansas, show an average increase of 243.5 pounds of seed cotton when all the crop was plowed under, as compared to an increase of only 61.5 pounds when the cover crop was removed as hay.

Soil reaction is important in determining favorable growth conditions for cover crops. The following crops are tolerant of medium acidity (pH 5.0-5.5)—Austrian winter peas, alsike clover, cowpeas, crotalaria, millet, oats, rye, ryegrass, sorghum, sudan grass, velvet-beans, vetch, and wheat. Crops tolerant of moderate acidity (PH 5.5-6.0) are—barley, crimson, hop, red, and white clovers, and soybeans. Crops growing best on nearly neutral soils are alfalfa, sweet clover and peanuts.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

A Living from Bees—By Frank C. Pellett, Field Editor of American Bee Journal. Orange Judd Publishing Co., Inc. (1943). $2.00.

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean of the School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $2.85.

Beef Cattle — By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Sons, Inc. $4.00.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers (1941). $2.00.

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. The Macmillan Co. $3.90.

Dairy Science—By W. E. Petersen, Ph.D., Assoc. Prof. and Assoc. Dairy Husbandryman, Univ. of Minn. Edited by R. W. Gregory. J. B. Lippincott Company (1939). $4.00.

Farm Shop Practice—By Mack M. Jones, M.S., Prof. Agri. Engineering, Univ. of Mo. McGraw-Hill Book Co., Inc. $2.75.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. The Macmillan Co. $2.90.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.00.

Forestry in Farm Management—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. (1941). $3.00.

Grow Your Own Fruit—By M. G. Kains, formerly with U. S. Dept. of Agriculture; Professor of Horticulture, Pennsylvania State College. Charles Scribner's Sons. $3.50.

How to Raise Rabbits for Food and War—By Frank G. Ashbrook, Fish and Wildlife Service, U. S. Dept. of the Interior. Orange Judd Publishing Co., Inc. (1943). $2.00.

Hunger Signs in Crops—Published by the American Society of Agronomy and The National Fertilizer Association. $2.50.

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.

Livestock Production—By Walter H. Peters, Chief of the Division of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $3.50.

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw-Hill Book Co., Inc. $4.00.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $5.00.

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $3.75.

Practical Poultry Management—By James E. Rice, Emeritus Professor of Poultry Husbandry, and Harold E. Botsford, Extension Professor of Poultry Husbandry, both at New York State College of Agriculture. Fourth Edition (1940), John Wiley & Sons, Inc. $2.75.

Practical Horse Breeding and Training — By Jack Widmer. Charles Scribner's Sons (1942). $3.00.

Repairing Farm Machinery—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue University. The Interstate Printers & Publishers. $1.80.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.00.

Sheep—By Levi Jackson Horlacher, Prof. of Animal Husbandry, Univ. of Kentucky. The Interstate Printers and Publishers. $2.00.

Soil Conservation — By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.

Some Common Diseases of the Horse—By George R. Conn, B.S.A.H., D.V.M., Orange Judd Publishing Co., Inc. (1942). $1.50.

Some Common Diseases of Cattle—By George R. Conn, B.S.A.H., D.V.M. Orange Judd Publishing Co., Inc. (1942). $1.50.

Soybeans—Gold from the Soil — By Edward Jerome Dies. The Macmillan Co. $1.75.

The Home Veterinarian's Handbook—By E. T. Baker, Veterinarian, Moscow, Idaho. The Macmillan Company (1943). $2.50.

The Farm Primer—By Walter Magnes Teller, formerly with the Farm Security Administration, U. S. D. A. David McKay Co. $2.50.

BOOK NOTES

America's Garden Book—By Louise Bush-Brown, Director of the School of Horticulture, and James Bush-Brown, Landscape Architect.

This is a refreshingly practical and comprehensive volume. It tells the whole story of garden processes in smallest possible compass, without being elementary or incomplete. The thirty-four chapters present all possible topics in gardening, and include such timely subjects as Soil and Soil Improvement, Lawns, The Home Fruit Garden, The Home Vegetable Garden, Coldframes and Hotbeds, House Plants, Diseases and Insect Pests, Ornamental and Woodland Gardens.

Publishers: Charles Scribner's Sons, 1939. 1222 pages. 200 photographs and diagrams. $3.50.

Plowman's Folly — By Edward H. Faulkner, agricultural expert and teacher, soil and crop investigator, formerly county agent in Kentucky and Ohio.

Plowman's Folly is described as perhaps the most important challenge to agricultural theory yet advanced in this century. Mr. Faulkner says that the book sets out to show that "the moldboard plow is the least satisfactory implement for the production of crops" and points out that soil impoverishment, erosion, decreasing crop yields, many of the adverse effects following droughts or periods of excessive rainfall may be traced directly to the accepted practice of plowing natural fertilizers deep into the soil. This book has become a "runaway bestseller."

Publishers: University of Oklahoma Press (1943). 161 pages. $2.00.

For the convenience of our readers, books listed may be purchased through this Department. Address Farmers Digest, Ambler, Pa.

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